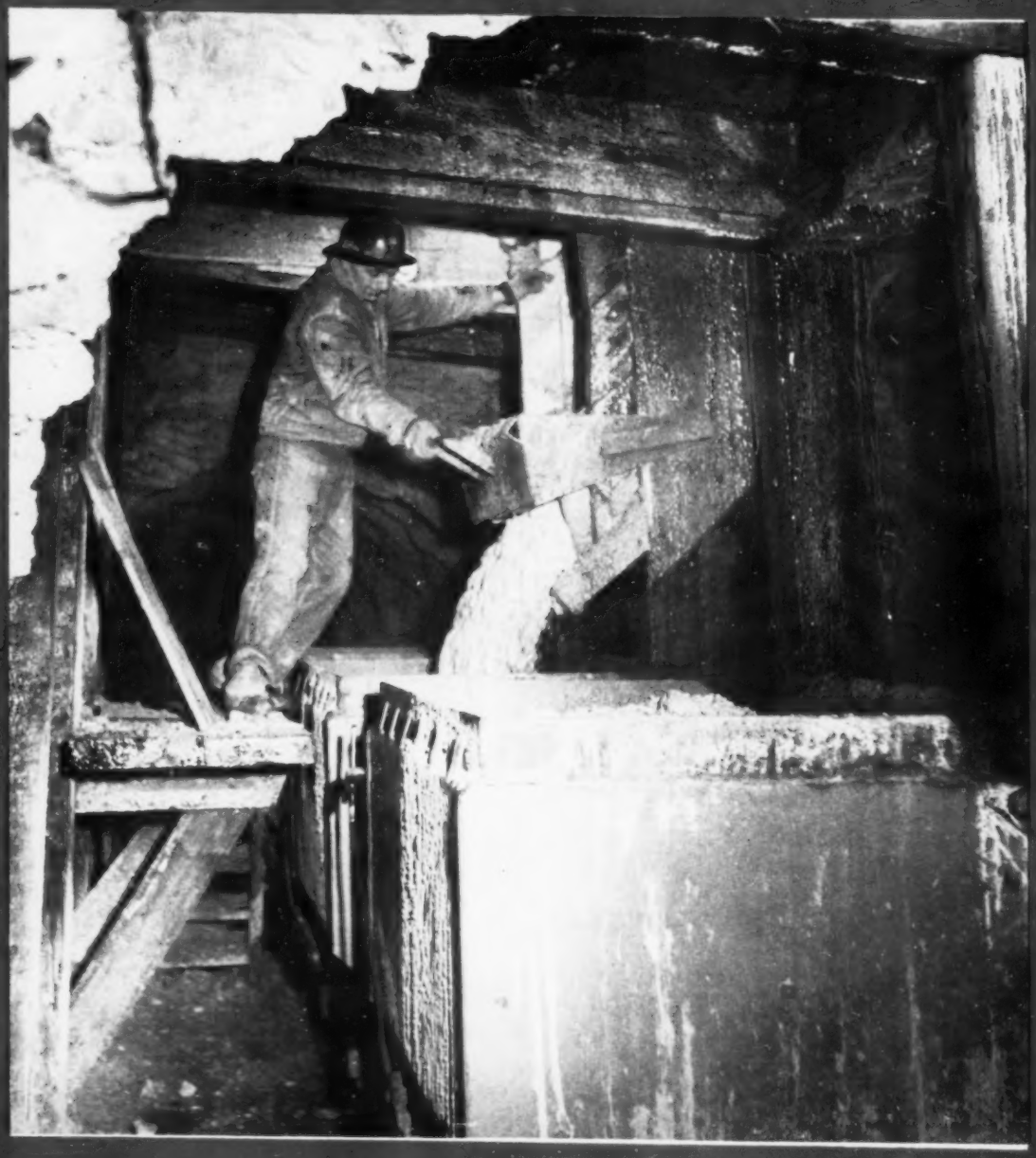
MINING WORLD

APRIL 1958

VOL. 20 NO. 4

How Magma Floats Copper Flux From Mine Ore Page 43

Calumet and Hecla Develops Ambrosia Lake U_3O_8 Page 46



Loading Silver-Lead Ore at Lucky Friday

Page 38

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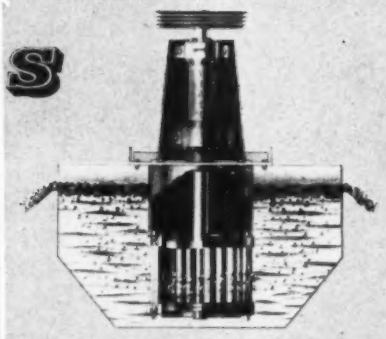

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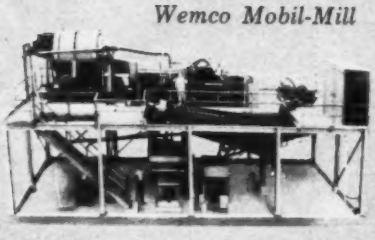
Wemco Mobil-Mill



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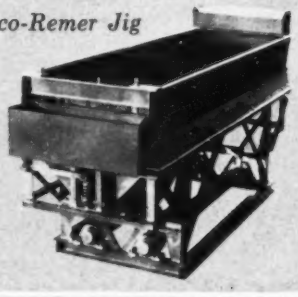

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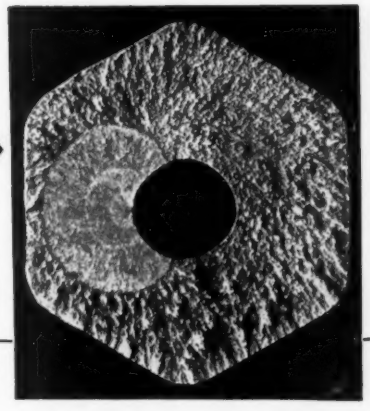

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THE NO. 977—POWER AND VERSATILITY FOR MINING

Mining World

Including the Export Edition **WORLD MINING**

Published monthly except in April when publication is semi-monthly

VOLUME 20 **APRIL 1958** No. 4

OPERATIONS—TECHNOLOGY

Underground Mining

Idaho's Lucky Friday Has a Bright Future 38

BY STANLEY DAYTON

Persistent development of a minor surface stringer has assured an important and profitable mine as the stringer widened, lengthened, and increased in silver-lead-zinc content with depth. Another example of successful deep exploration in Idaho's Coeur d'Alenes.

C&H Develops New Uranium Mine Through Long Flat Incline .. 46

Calumet and Hecla, long an important Michigan copper miner found, developed, and is mining uranium at Ambrosia Lake, New Mexico. C&H chose an incline large enough for trucks to haul direct to shipping bin from mine face as the best way to develop the Marquez mine.

Flotation

Magma Copper Floats Silica From Copper Tailing For Smelter Flux 43

BY E. J. CALDWELL AND HALDER REX

Magma Copper recovers silica from copper mill tailing and pumps it to smelter to make a tailored furnace feed. Thus the ore produces both copper concentrate and silica flux for smelting.

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Argentina's Valcheta District Fast Developing as Major Producer 49

BY JOHN R. BOGERT

Since 1950 prospectors have found manganese, lead, fluorspar, tungsten, copper, and iron in eastern Argentina. Several mines have been developed and more ore will be found with further prospecting.

Smelting

Continuous Copper Cake Casting 52

American Smelting and Refining Company's new installation at Perth Amboy, New Jersey produces 25 foot long 19,000 pound tough pitch copper cakes.

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ON THE COVER

The cover photo shows a chute tapper at the shaft pocket of Lucky Friday Silver-Lead Mines Company's adit level, near Mullan, Idaho. Once labeled an unpromising prospect, Lucky Friday has developed into one of the great producers in the Coeur d'Alene district.

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Associate Editor .... Stanley Dayton
Mgr., Eng. Serv. .. H. G. Grundstedt
News Editor ..... Janet M. Taylor
Ass't News Editor ..... G. H. Pecher
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New York City Office
370 Lexington Avenue
Murray Hill 3-9295

Dist. Mgr., New York .. A. E. Roberts

Chicago Office
1791 Howard Street
Rogers Park 4-3420

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Vancouver Office
402 Pender St. West
MUtual 5-7287

Assoc. Editor ..... Charles L. Shaw

European Residence
25, Montagu Square
London W1, England
WELbeck 3624

Acting European Mgr.
Max F. Holsinger

STAFF CORRESPONDENTS: **Africa**—Johannesburg, Union of South Africa; Salisbury, Southern Rhodesia; Luanshya, Northern Rhodesia; Kampala, Uganda. **Asia**—Ankara, Turkey; Kuala, Lumpur, Malaya; Bombay, India; Tavoy, Burma; Karachi, Pakistan; Seoul, Republic of Korea; Tokyo, Japan. **Europe**—London, England; Vienna, Austria; Stockholm, Sweden; Trondheim, Norway; Paris, France; Redruth, Cornwall; Madrid, Spain. **North and Central America**—Vancouver, British Columbia; Mexico, D. F., Mexico. **Oceania**—Port Kembla, Australia; Manila, Republic of the Philippines. **South America**—Lima, Peru; La Paz, Bolivia; Buenos Aires, Argentina.

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MILLER FREEMAN PUBLICATIONS

Drifts and Crosscuts

Is This the Bottom?

While London Metal Exchange prices remain well below domestic prices for copper, lead, and zinc, and European prices for tungsten, mercury, and other metals are lower, too, recent advices indicate a "firming" in prices.

European prices are not as low as they look because freight, insurance, handling fees, warehousing, minor duties etc. must be added for a comparable United States price. Nevertheless European prices have set the decline and any indication that the bottom has been reached should come from there.

While many will argue that production cut backs are "too little and too late," there are growing reports on a world-wide basis, for most metals, that many mines are losing money today. Some mines are making money, too, but the number continually lessens.

Bancroft Mines, Ltd. in Northern Rhodesia's famed Copperbelt is not making any money. Cerro de Pasco Corporation has asked its Peruvian workers not to request a new wage contract. Australian zinc producers have stopped zinc shipments, but concentrate stockpiles continue to grow. The Western Germany lead and zinc miners are asking the government for a Reconstruction Loan Corporation credit plan to keep mines in operation there. So you see, it's broader than the United States.

Even Canada's new mines, efficiently operated mines, too, having the most modern and latest equipment for low-cost production, have felt the pinch. American Metal Climax, Inc. and International Nickel Company of Canada, Ltd. have curtailed production at their Heath Steele Mines Limited's copper-lead-zinc open pit and underground mines in New Brunswick.

The same story from Mexico. San Francisco Mines of Mexico, Limited reports its lead-zinc operations barely profitable and that the problem and cost of financing rising unsold metal stocks worsens.

SHOCK! Broken Hill lead-zinc mines to close for one day per fortnight! This is the word and reaction from Australia where some of the world's highest grade lead-zinc ores are mined. The costs of producing copper at Africa's largest mines is shown on the International Panorama page of this magazine.

Thus, the pendulum of supply and demand swings. Low prices inexorably bring lower output; then the pendulum reverses as demand picks up faster than production. Today, the production capacity exists. Even with increased demand, prices will not soar again to encourage metal substitutes; in fact, all indications point to lower output and the bottom of the metal price slump.

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MINING WORLD NEWSLETTER

Arizona . . . . Liberia . . . . Brazil

April 1958

Will columbium become the next big-tonnage metal?

Almost a rare metal until now, with total world production around 2,500 tons annually, suddenly two breakthroughs have occurred which promise a great future for this metal.

First, a novel process has been developed for electronic melting and casting of the metal which is said to be superior to the arc melting process. Electronic-beam-melted materials can be purified faster and cheaper because a large quantity can be produced at any given time. Temescal Metallurgical Corporation, Stauffer Chemical Company, and Mallory-Sharon Metals Corporation are associated in the joint venture.

Second, a 350,000,000-ton high-grade deposit has been located in Brazil. Containing an estimated 11,000,000 tons of metal could be produced. A big U.S. strategic metal refiner has control of the property.

Other large deposits include the Oka deposit near Montreal, Canada, held by Kennecott Copper Corporation; Sukulu Mines' large apatite-columbium deposit in Uganda; Norway's 6,000,000-ton reserve of columbium-rich limestone in the Sove mine.

Look for a buyer's market in foreign iron ore within the next few years. Major mines are under development all over the globe.

Tremendous production is already coming from Venezuela, Canada, and Peru.

Several major deposits are now being prepared to enter the competition. Liberia, Canada, Brazil, and Venezuela may be fighting for a place in the world market by 1960.

The big producers must solve these problems: Cerro Bolivar has to dredge the Orinoco River continually, which adds to cost; large percentages of its ore must be screened and sintered for furnace use. Iron Ore Company of Canada deposits have lower iron content than many newer foreign ones. Marcona has no fresh water for beneficiation.

The large new projects have their problems, too. For example: LAMCO in Liberia and Hanna in Brazil must both build long railroads to the coast and then construct a port.

But, these advantages outweigh other considerations — the Liberian deposit of LAMCO is very high-grade (65 to 67%), has good structure and low impurities; Hanna's Brazilian reserves are huge; developing Canadian deposits share closeness to the largest market in the world — the U.S. Great Lakes steel mills, and, though in grade, the ore is easily upgraded to yield superior blast furnace charge.

Meanwhile, one of the earliest entrants in the field, Mineroferroviaria de Venezuela (Mivenca) will have to get moving to get into the race.

Staking activity reminiscent of the uranium boom has hit Graham County, Arizona.

Helicopters whirl overhead with survey crews, geophysical instruments, drillers, and supplies.

Freshly dozed roads provide access to new drilling sites in the mountains.

Copper is the metal eagerly sought, despite the current oversupply on the world market.

Big companies and big money have explored the area: Rare Metals Corporation of America, Bear Creek Mining Company, Consolidated Coppermines, Phelps Dodge.

Old mines are being re-examined: the San Juan, the Esperanze, Lone Star, North Star, and Kirtland Hills.

There's copper there, but the big question is: Can it be mined economically?

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Secretary Seaton Called To Recommend A "New" Long Range Minerals Program

Senator James E. Murray, chairman of the Senate Interior Committee, has notified Secretary of the Interior Fred A. Seaton to come before his committee at 10:00 a.m., March 24, 1958, to present further recommendations for a long-range mineral program. Senator Murray observed that Assistant Secretary Royce A. Hardy testified a short time ago that he had made certain proposals to Secretary Seaton along these lines and "this will give you an opportunity to present your further recommendations to the committee."

Industry witnesses also will be called, as well as Secretary of Commerce Sinclair Weeks.

According to Capitol sources the Senate Interior Committee is finding it difficult to formulate practical legislation from the bill which Secretary Seaton submitted to the Congress last year as a partial long-range minerals program. During hearings on the Seaton bill, industry witnesses stated that not enough minerals were covered and those specified in the bill were to be given subsidies which are too small to allow domestic mines to operate against foreign import prices. The Senate and House Interior Committees are up against this difficulty: if they liberalize the Seaton bill to suit industry, it probably would be vetoed; if they report it "as is," domestic industry will not be benefited.

In view of the testimony taken on the Seaton bill by the Senate Interior Committee last June it seems high time that the Secretary should come up with practical revisions of his bill that industry, the Congress and the Administration can live with. Miracles can happen!

• No Breakthrough For Low-Grade Manganese

While testifying before the Interior subcommittee of the House Appropriations Committee, Paul Zinner, assistant director of the U. S. Bureau of Mines for Programs, was asked about the status of domestic manganese. Zinner replied:

"In the long term we are no better off than we have been in the past and we continue to look for some breakthrough in using low-grade manganese resources. There is no question that we have tremendous quantities of manganese in this country tied up in relatively low-grade sources or resources.

"In the normal economic pattern they just do not enter the picture at the moment. If the demand became so great that price was no factor, we could meet the manganese demand from these sources. Our endeavor is to try to narrow this gap so that the manganese deposits will enter into the peacetime economy and thereby support an industry in this country. All of the processes that we have investigated have one common weakness and that is that they cost too much in the present economic picture."

The Bureau of Mines and the General Services Administration have spent millions on manganese beneficiation and it must be galling to have to admit that none of the processes has proved to be economically feasible.

• Brossard Said Rate Would Be 2 Cents

In discussions relative to the present low price of copper, there seems to be a good deal of misunderstanding about the amount of import tax which would be restored should the producers drop their quotation below the peril point of 24 cents. A quotation from a memorandum written by Edgar B. Brossard, chairman of the United States Tariff Commission, on July 23, 1957, should clear up the matter. Brossard said,

"At the 1956 GATT negotiations which resulted in the 15 percent reduction of the tax on copper (under which the second stage of the reduction became 1.8 cents per pound on June 30, 1957) it was the clear understanding of the parties concerned that the previous concession rate of 2 cents per pound woud be the applicable rate whenever the copper price fell below 24 cents per pound."

• Watkins Copper Bill Is Ill-Advised

Senator Arthur V. Watkins of Utah has introduced what appears to be an ill-advised bill. This is S. 3234 "To repeal the suspension of certain import taxes on copper."

At first blush, a bill to restore the copper import tax at a time when copper is selling at distress prices sounds quite logical. It must be noted, however, that as long as this suspension exists (it runs to June 30, 1958) the Congress can act upon the proposal to raise the peril point to 30 cents and increase the tariff to 4 cents without being in the same predicament before the House Ways and Means Committee as were the producers of lead and zinc. When there is no tariff the United States Tariff Commission cannot entertain an escape clause petition. In the case of lead and zinc, Ways and Means insisted that the Tariff Commission administrative relief route be taken before it would act on a bill. The committee might well do the same thing in the copper case were it made possible by the passage of the Watkins bill, and any action whatever would be delayed for months—conceivably for nearly a year. It would seem that Senator Watkins was sold "a bill of goods."

• Assessment-Work Suspension Proposed

Senator Allen Bible of Nevada has introduced S. 3315, a bill to suspend annual assessment work on unpatented mining claims. Congressmen have had an increasing number of letters demanding suspension of assessment work, but the sentiment in general is against such a measure except during emergencies when manpower and materials are in short supply. The more recent justification appears to be that assessment work was suspended during the depression

of the 1930's, that we are in a depression now; ergo, this bill is justified. Another line of thought is that suspension would help the mining business out of its immediate depression. Both of these rationalizations seem a little thin, though they may have some political appeal.

As a matter of fact these things sometimes cut several ways—those who do annual assessment work for absentee claim-holders will be out of work, for instance—and mining's difficulty is inflation combined with low metal prices. Suspension of assessment work will hardly cure this situation. Also, development of the public domain—so far as assessment work helps development—will suffer.

• Kirwan Committee Reports on Tungsten

It will be remembered that Representative Mike Kirwan of Ohio was responsible for cutting off the tungsten purchase program set up by the Congress under Public Law 733, thereby bankrupting the domestic tungsten producers and shutting down the domestic tungsten mining industry. Anyone who believes that Kirwan has the slightest soft spot in his heart for tungsten producers, or will make any move to bail them out, should read the report of his House Appropriations Subcommittee on Interior Department appropriations.

Referring to the request of the Defense Minerals Exploration Administration for funds for the coming fiscal year, Kirwan's Subcommittee says in its report:

"Despite the fact that government inventory of tungsten is far in excess of mobilization requirements, it remains on the list of commodities eligible for DMEA assistance and a new contract was entered into as recently as December 1957. The committee sees absolutely no justification for additional expenditures of federal funds for this purpose and directs that no additional tungsten contracts be approved."

Kirwan's insistence upon cheap tungsten for the manufacturer can be rationalized, but in cutting out the DMEA appropriation for tungsten he overlooks some important facts. The DMEA program has nothing to do with getting cheap tungsten for his friends, and if miners are foolish enough to match funds with the government to discover minerals they can't peddle they should be allowed to do it because the real purpose of the program is to discover reserves for the future. Consequently, Kirwan is doing a particular disservice to the United States and may be substantially hampering the national defense and economy years from now.

It is such people as Kirwan who throw the usually satisfactory Congressional committee seniority rule into disrepute.

COMING CONVENTIONS

April 14, 15 and 16. The 40th Annual meeting of the AMERICAN ZINC INSTITUTE and the 30th annual meeting of the LEAD INDUSTRIES ASSOCIATION, Chase-Park Plaza Hotels, St. Louis, Missouri.

April 17, 18, and 19. Pacific NORTHWEST REGIONAL CONFERENCE of the AIME. Davenport Hotel, Spokane, Washington.

April 22. Symposium on MINERAL PROCESSING at the Canadian-United States Chemical Engineering Conference, Sheraton-Mt. Royal Hotel, Montreal, Quebec, Canada.

May 9 and 10. Montana School of Mines Symposium on Design and Emplacement of Mine Stope Fill. Butte, Montana.

May 9, 10 and 11. Annual Meeting of the URANIUM SECTION of the AIME, Moab, Utah.

An Unfailing Market for:

GOLD • SILVER • COPPER
LEAD • ZINC

Ores • Concentrates • Bullion
Precipitates • Furnace Products

FOR SCHEDULES, FREIGHT RATES, ETC., WRITE TO YOUR NEAREST OFFICE

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ASARCO — American Smelting and Refining Company

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East Helena, Montana

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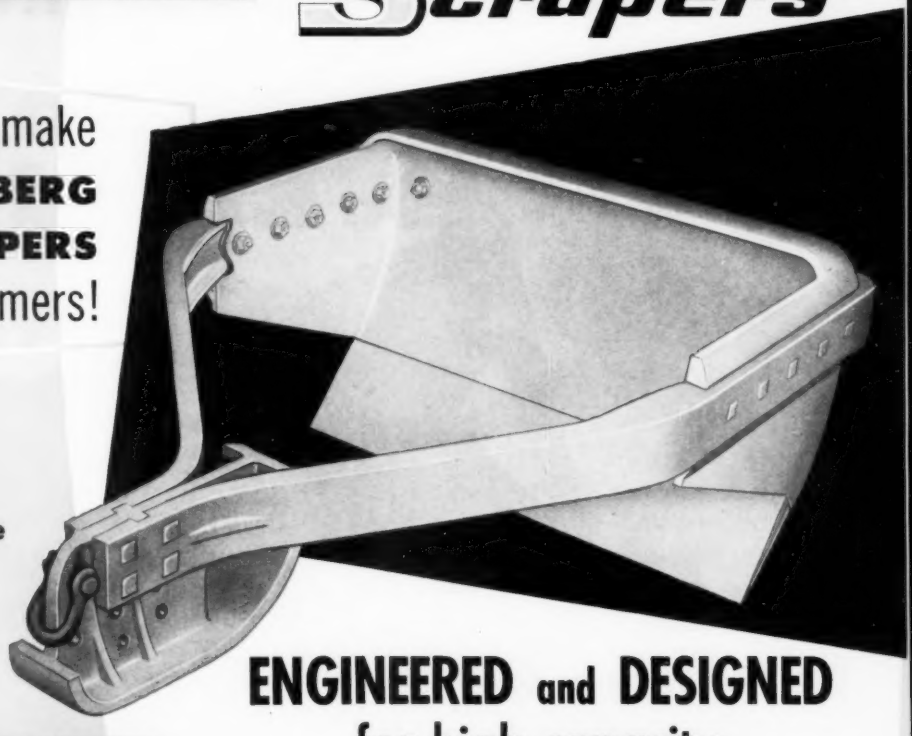
Tucson, Arizona

ALL-NEW Superior Scrapers

these features make
THOMPSON-BERG
"SUPERIOR" SCRAPERS
outstanding performers!



Interlocking arm design
Extra-long side plates
One-piece, replaceable blade
Exclusive, contour back
Low, back-pull clevice
Adjustable, sliding shoe

Here's a typical example of a Thompson-Berg all-new TB Series, 48" "Superior" Scraper's full-load carrying ability. Picture shows scraping of bulky ore in yielding steel set slusher drift.

ENGINEERED and DESIGNED
for high-capacity, heavy-duty metal mining

The ALL-NEW Thompson-Berg hardened alloy steel, heavy-duty "Superior" Scrapers are *design-engineered and performance-proved* under grueling mining operations. Designated as the TB Series line, you can depend on "Superior" Scrapers to provide greater payloads . . . virtually eliminate downtime and high-cost maintenance. Outstanding features include: interlocking construction of shoe, and also arms to *exclusive* contour back; extra-long, integral side plates; one-piece replaceable steel blades in various lengths and widths.

Thompson-Berg slushing scrapers are available in eight sizes, ranging from 36 through 84 inches for use with slushers from 10 to 150 hp.

Try the "Superior" Scraper and find out why it's "tops" in ferrous and non-ferrous metal mining. For complete specifications write for new Bulletin TB-66. *Mail coupon today!*

Thompson-Berg Company
IRON MOUNTAIN, MICHIGAN

THOMPSON-BERG COMPANY
Iron Mountain, Michigan

Please send new Bulletin TB-66 describing the all-new line of "Superior" Slushing Scrapers, and complete specifications.

Name.....

Company.....

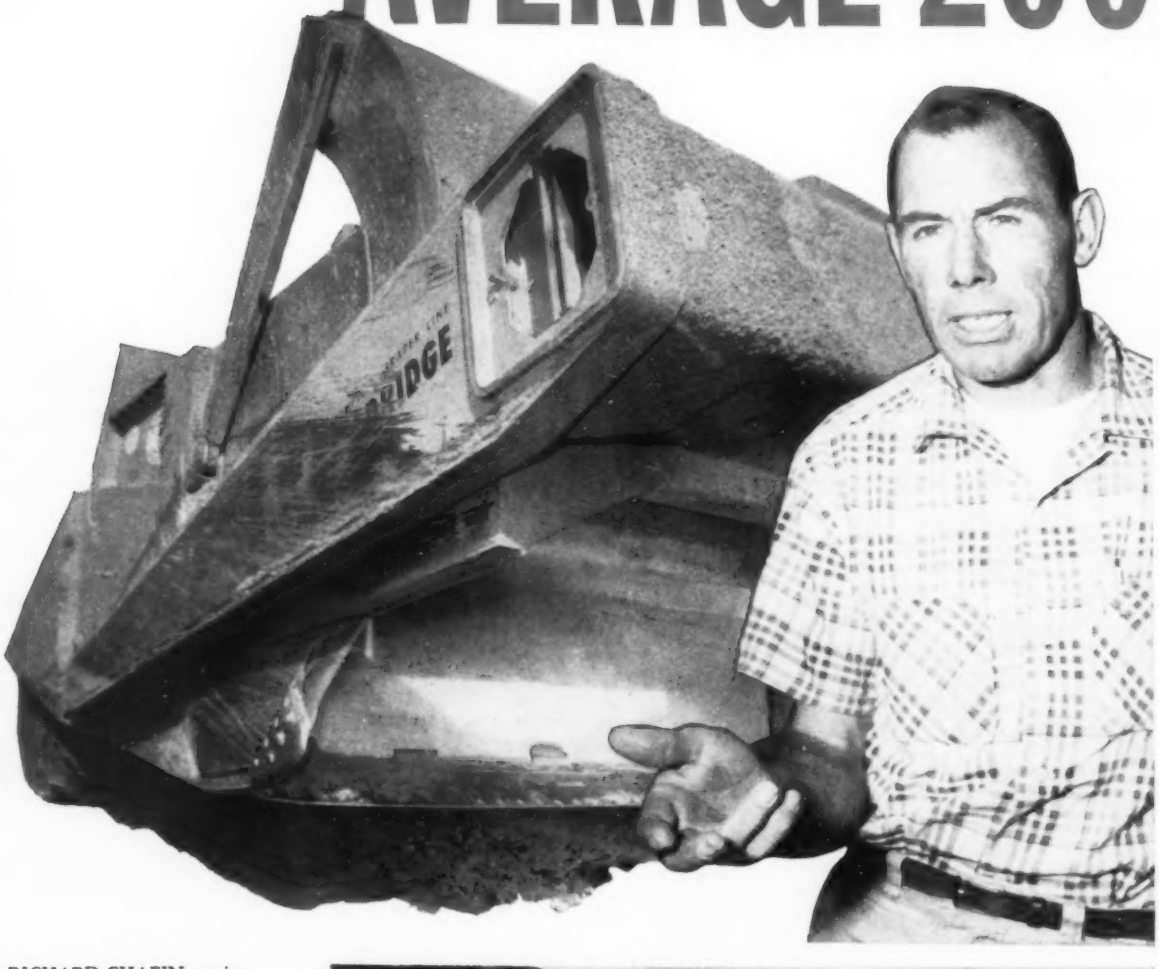
Address.....

City.....Zone....State.....

Telephone.....

ESCO CUTTING EDGES

AVERAGE 200



RICHARD CHAFIN, project engineer of Madonna Construction Company, uses ESCO cutting edges to keep maintenance costs low.

HOURS OF SERVICE
...on each side!

The Madonna Construction Company switched to *ESCO* cutting edges after on-the-job tests that "represented every known strata in southern California." Richard Chafin, project engineer, relied on *ESCO* bits to move 200,000 yards of sandy gravel, studded with 36-inch donickers... and in doing so compiled maintenance figures that showed *ESCO* bits averaging 200 hours before reversing.

Cutting edge longevity is only half the story. Bits that last longer mean less down time, lower charges against machinery idled through frequent bit changes. *ESCO* cutting edges, Chafin found, maintained the 150 cubic yard-per-hour rate that he considers essential if earth moving is to pay.

What *ESCO* products did for this project engineer, they can do for you. Put *ESCO's* durability to work for you. Use *ESCO* cutting edges —they'll save you time, when time is money.

See your nearest ESCO dealer or write direct.

ESCO®

ELECTRIC STEEL FOUNDRY COMPANY

2147 N. W. 25TH AVE. • PORTLAND 10, OREGON

MFG. PLANTS AT PORTLAND, ORE. AND DANVILLE, ILL.

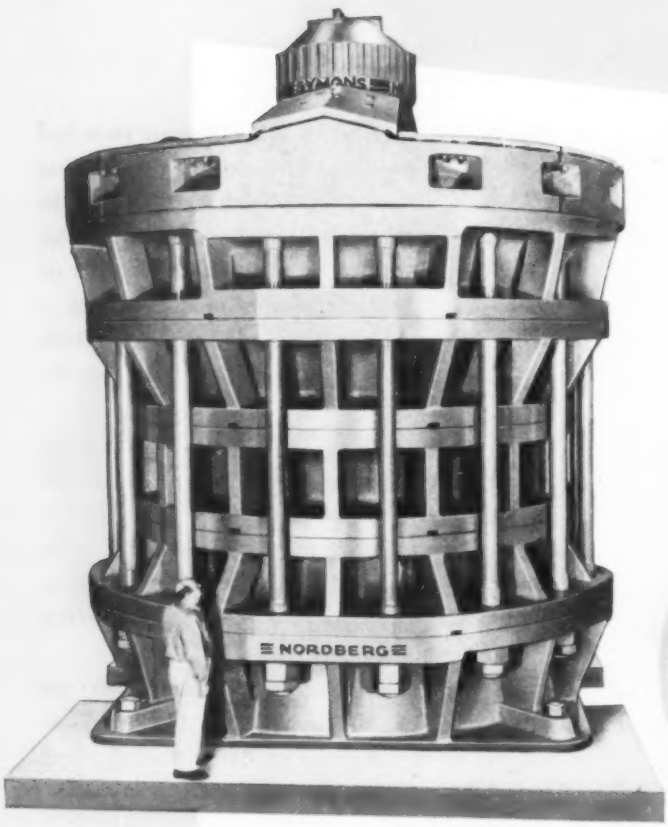
Offices in Most Principal Cities

ESCO INTERNATIONAL, NEW YORK, N. Y.

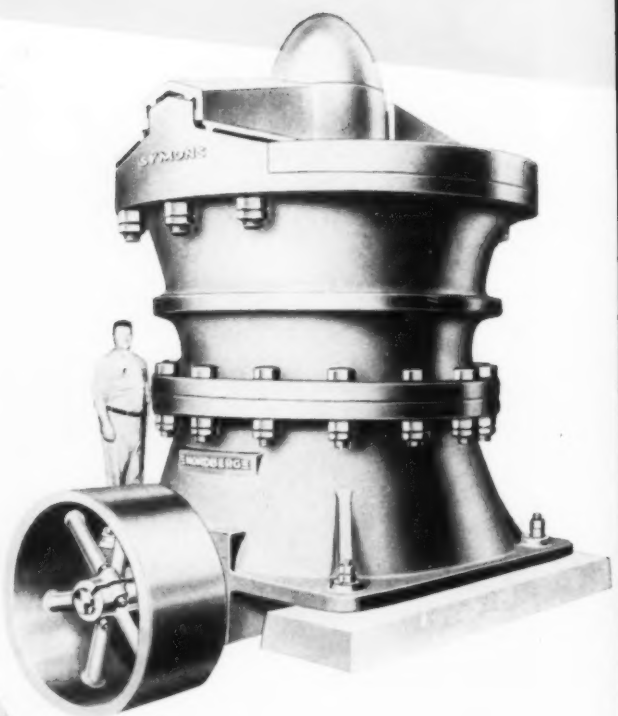
IN CANADA ESCO LIMITED

SYMONS®

GYRATORY AND
FOR PRIMARY AND



SYMONS 60" GYRATORY CRUSHER



SYMONS 30" GYRATORY CRUSHER

SYMONS
VIBRATING SCREENS

NORDBERG BALL,
TUBE AND ROD MILLS

SYMONS
VIBRATING GRIZZLIES

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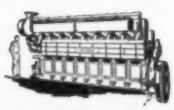


NORDBERG DIESEL—DUAFUEL® and
SPARK-IGNITION GAS ENGINES

CONE CRUSHERS FINE REDUCTION

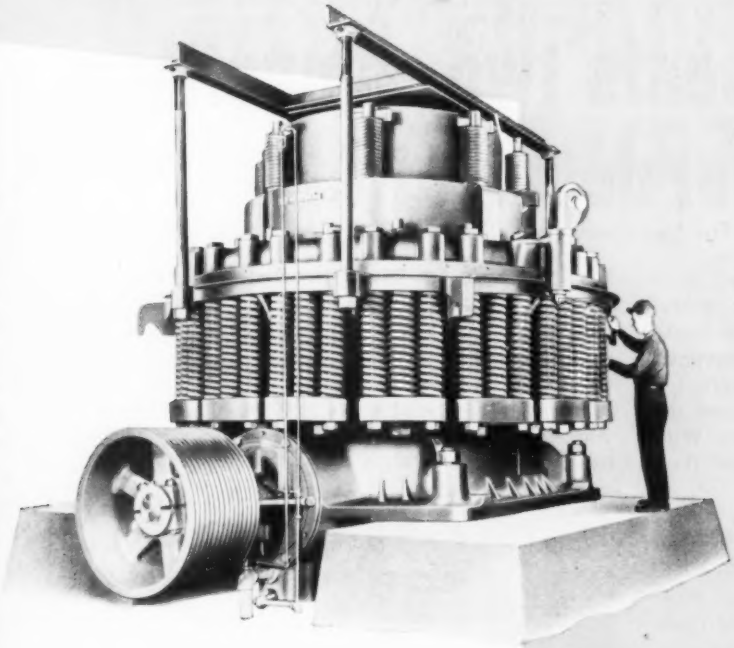
. . . greater productivity through more efficient crushing

Complete range of sizes from 6 to over 3500 tons per hour

All over the world, for big tonnage requirements and heavy duty crushing operations, Symons Gyratory and Cone Crushers are the outstanding choice of the mining and quarrying industries . . . because they *assure maximum and continuous production at low operating and maintenance costs.* For heavy duty primary breaking, Symons Gyratory Crushers are available in 30″, 42″, 54″, 60″ and 72″ sizes, for capacities up to 3500 and more tons per hour. For secondary and finer reductions, Symons Cone Crushers, in both Standard and Short Head types, are available in sizes ranging from 22″ to 7′—in capacities from 6 to 900 or more tons per hour.

Write for further information—Nordberg stands ready to serve you.

NORDBERG MFG. CO., Milwaukee, Wisconsin



SYMONS 7′ EXTRA HEAVY DUTY CONE CRUSHER

© 1956, Nordberg Mfg. Co.

C256

SYMONS . . .

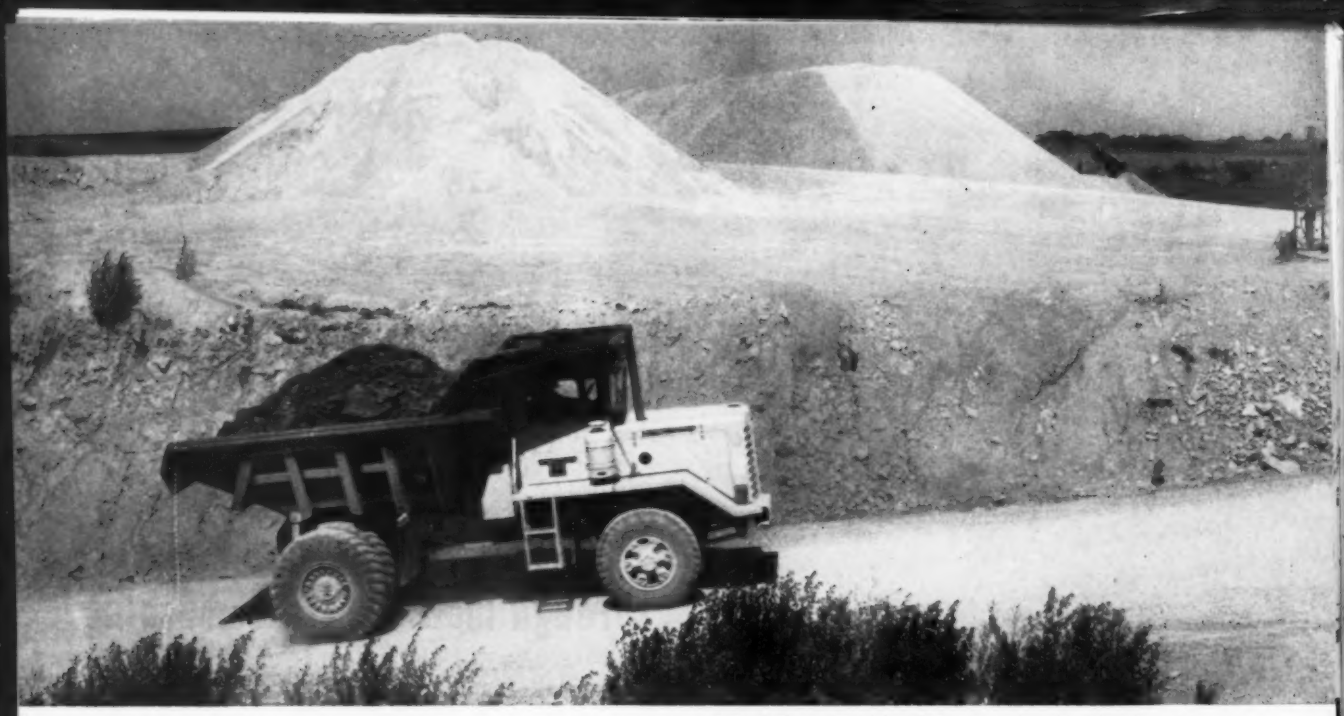
A REGISTERED NORDBERG TRADEMARK

KNOWN THROUGHOUT THE WORLD

NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • DULUTH • WASHINGTON
TORONTO • MEXICO, D.F. • LONDON • JOHANNESBURG



Out of the pit with 18-tons of shovel-loaded limestone comes the "65" Payhauler owned by Lee Crawford Quarry Co., Cedar Rapids, Iowa. The 1,200-foot haul includes a 400-foot 15% grade. The "65" was chosen on competitive demonstration.

"65" Payhauler® beats two competitors on tough, 50-hour demonstration

—for Lee Crawford Quarry Co., Cedar Rapids, Iowa

Veteran quarryman Lee Crawford invited three makes of off-highway haulers to go into his pit and "roll up their sleeves." He wanted hauling that could match the crushing efficiency of his newly-equipped plant which is as nearly perfect as could be built.

One make of hauler could not match crusher capacity. Another kept the monkey wrenches busy. Winner of the 50-hour test: the International "65" Payhauler!

"Perfect Payhauler performance made our choice easy," states Plant Superintendent Kenneth Mercer. "The '65' hauled bigger loads easily up the 15% grade out of the pit. It dumped cleaner, and up to three times faster—and got away faster for shortest cycle time.

"With the '65,' we have achieved our plant efficiency goal."

Try the exclusive high reverse and "zip-around" power steering—that give 18-ton "65" or 24-ton "95" regular pick-up truck spotting ease. Measure capacity-adding Payhauler get-away speed—and the fuel economy of its load-matched, turbo-charged diesel power. Measure super-fast Payhauler dumping speed. See your International Construction Equipment Distributor for a demonstration!

INTERNATIONAL® CONSTRUCTION EQUIPMENT

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines . . . Motor Trucks . . . Farm Tractors and Equipment.

International Harvester Company
180 North Michigan Ave.
Chicago 1, Illinois

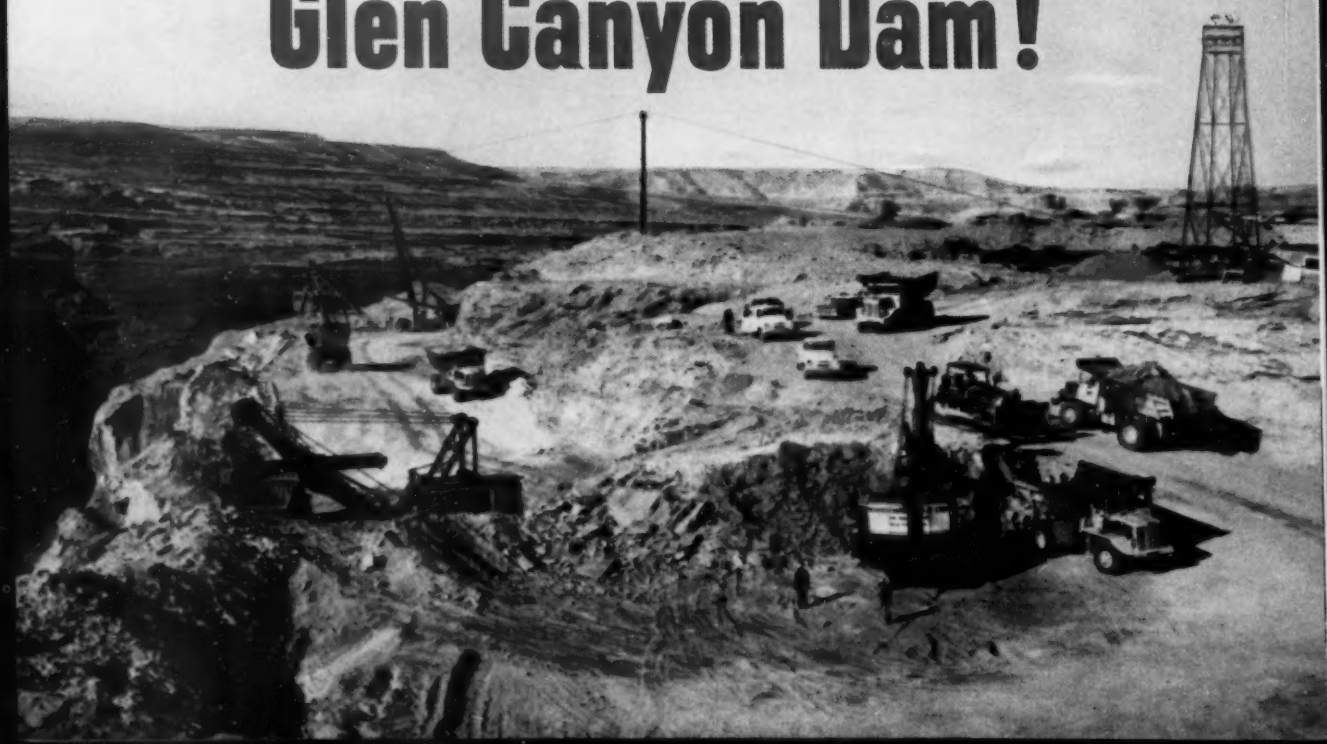
Gentlemen: Please send me a free copy of the new, fully-illustrated Payhauler catalog (Form CR-603-G).

Name_____

Street Address_____

City_____ State_____

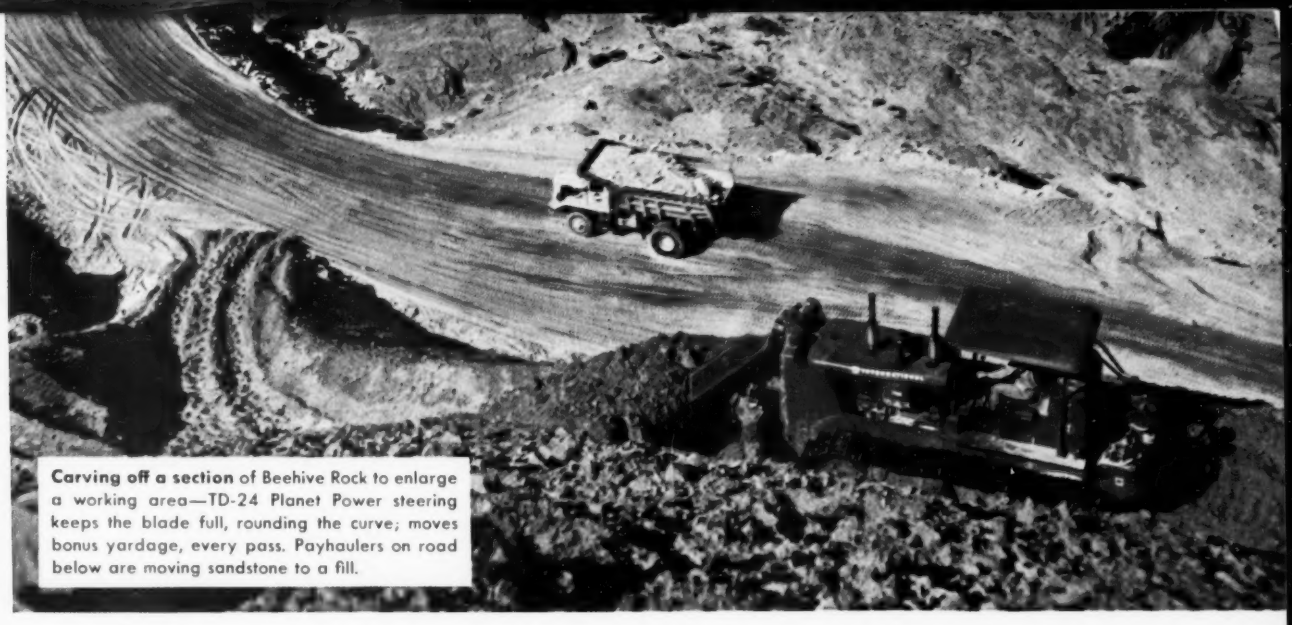
Merritt-Chapman & Scott mobilizes International® fleet to build colossal Glen Canyon Dam!



Noon time is inspection time as Merritt maintenance men, using International welder and shop trucks, roll up to Marion power shovel for fast, on-the-job service.

$108 million contract crawlers, haulers,

"95" Payhauler fleets keep busy on both sides of the 700-foot-deep canyon. These three units are hauling shovel-loaded rock from spillway excavation on the huge Glen Canyon Dam project.



Carving off a section of Beehive Rock to enlarge a working area—TD-24 Planet Power steering keeps the blade full, rounding the curve; moves bonus yardage, every pass. Payhaulers on road below are moving sandstone to a fill.

rolls on schedule with International® trucks and service!

8-passenger International Travelall, with hill-climbing four-wheel-drive, transports engineers and surveying equipment over rough terrain right to the dam site.

Here a rugged International truck with boom rig is used by electrical linemen to set up important transmission lines on the east side of the Colorado River.

MERRITT-CHAPMAN & SCOTT CORPORATION is shooting to complete its $108,000,000 Glen Canyon Dam contract—biggest competitively bid job ever awarded to a single contractor—well ahead of the specified seven-year limit. A big fleet of International equipment helps keep this huge Bureau of Reclamation project on the Colorado River in Northern Arizona rolling at record pace.

Planet Power-steered TD-24 crawlers prove the worth of full-time live power on both tracks—blading bonus loads 'round the curves. Grade-beating "95's" high-balling rock show why a load-and-road-matched Payhauler® fleet—bonus-powered with turbo-charged diesel engines—belong on this tough, high-altitude job. International trucks are here, there, and everywhere—handling a multitude of different material, equipment, and personnel-carrying assignments.

And complete International parts and service is minutes close to insure high performance availability of every International machine.

Making ready for power. Conventional International truck with engine-driven auger sinks holes for transmission lines.

On-the-spot maintenance. International shop truck moves in as shovel takes "fuel break" from International cab-forward tanker.

Big capacity. Six-wheel heavy-duty International truck with 5,000-gallon tank sprinkles water for compaction of road base.

Ready for any emergency. Merritt medical crews use International Travelall ambulances, complete with oxygen and first aid equipment, to provide mobile first aid. One stands by on each side of the river.

Track-roller lubrication of the TD-24's only needs to be done each 500 working hours. A cab-forward International truck, provides an efficient, mobile "service station." This compact International was chosen for exceptional maneuverability.

Prompt, performance-backing International service ... company and distributor ... *keeps 'em rolling!*

The complete service resources for which International is world-famous are on the job for Merritt-Chapman & Scott—to help keep all International equipment rolling and producing!

It makes no difference that the job is remotely-located and 125 miles from the nearest rail-head. International, the distributor, and the dealer concerned have augmented existing parts stocks and facilities—have set up supply channels that assure on-the-spot parts availability.

Specialized distributor and company servicemen are so promptly available it's as convenient as a "down-the-street" service department.

YOU CAN HAVE THIS SAME big-capacity, specialized International performance—wherever you operate and on whatever scale—and with top performance-backing company, distributor and dealer service. See your International dealer or distributor for a demonstration of the construction equipment and motor trucks you need for high-balling your next job!

International Harvester

International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Ill.

A COMPLETE POWER PACKAGE: Crawler and Wheel Tractors . . . Motor Trucks . . . Self-Propelled Scrapers . . . Crawler and Rubber-Tired Loaders . . . Off-Highway Haulers . . . Diesel and Carbureted Engines.

No. 4 in a series

Right off the Wire

Power for earth satellites could be supplied by a new chemical battery that uses a dye to convert sunlight into electricity.

A new bearing metal of tin and aluminum is said to combine the bearing qualities of one with the light weight of the other.

Negatively ionized air is being used as a painkiller for patients with severe burns. After two exposures of twenty minutes each no narcotics are needed.

Users of High Voltage cables should note that high molecular weight polyethylene can be expected to have a voltage life about seven times that of standard polyethylene. (From paper on Dielectric Strength and Voltage Life of Polyethylene, presented at AIEE Winter General Meeting, February 1958, by Messrs. Hunt, Ware and Koulopoulos of Simplex.)

A new, automatic door opener is installed overhead, like a door check, and requires no complex, under-floor wiring. It can be installed in a few hours.

In a new cook stove the heat is generated in the utensil by putting it in a magnetic field. No heat is wasted and spilled food does not burn. It is said to be faster than ordinary electric stoves.

The "cage zone" melting system has proved successful in purifying niobium. Under high vacuum the metal is melted by high frequency current and the impurities separate to be cut off later.

A vinyl lining material for swimming pools of masonry or wood is in the form of sheeting with an adhesive back that sticks to the sides and assures complete waterproofing.

To meet the growing demand for power by industry, Simplex has installed new equipment that allows cable cores of greatly increased diameters to be armored with CONDEX, the interlocking armor tape made by Simplex since 1924.

Printed pages can actually be made to talk by means of a Japanese invention. The back of the paper is treated like magnetic tape and produces recorded sounds when a reproducing head is passed over the printed words.

Further information on these news items and on Simplex cable is available from any Simplex office. Please be specific in your requests.

A new, thirty-nine-passenger bus for intercity service is claimed to have many advantages. It has a flat floor (no step-up to seats), a "recreation area," lavatory, reclining seats and air suspension.

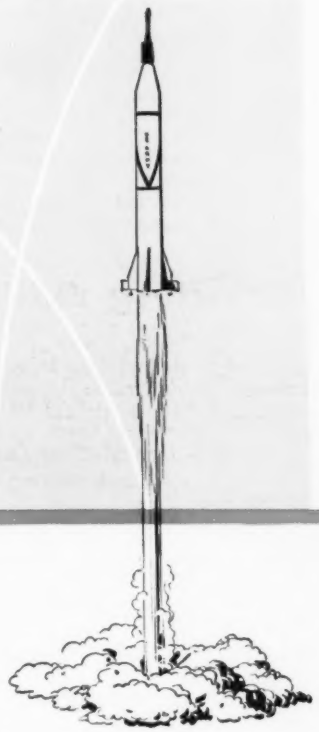
The size of electrical components may be further reduced by a process for putting tiny germanium transistors into printed circuits.

Buildings are being erected with the use of balloons instead of derricks.

A method of projecting color pictures on a screen from black and white slides has been discovered.

An acknowledged leader of the cable industry in research and manufacturing skills, Simplex scientists and engineers present technical papers on a variety of subjects of interest to users of insulated cables. A list of papers read before the AIEE and other associations will be sent on request.

"the American manufacturers of transoceanic telephone cables"



Underwater nerves take the "miss" out of missiles

Test rockets fired from the U. S. Air Force Test Range in the Bahama Islands are tracked electronically from a series of check points along their routes. This close observation detects the slightest variance from the missiles' intended flight path. The vital communications link for this work is a 1400-mile Simplex submarine cable to Puerto Rico — a product of the world's most modern techniques in under-water cable manufacture.

For high voltage power transmission or the most exacting communications cables, Simplex' research, engineering and manufacturing facilities are at your service.

SIMPLEX WIRE & CABLE CO.
Cambridge, Massachusetts and
Newington, New Hampshire

Simplex

Highest quality cables for: Mining
Power & Lighting • Construction
Transportation • Communications
Signalling

"Not merely to sell; but to serve . . . not only to make good steel products; but to make them still better . . . not only to fulfill today's requirements; but to anticipate tomorrow's—these are the principles that constantly guide CF&I."

G. F. Kranz
President

Grinding Mill Bulletin #1

CF&I is firmly convinced of the value—to us as well as to our customers—of our president's words, quoted above. In line with this principle, we are now commencing a series of ads designed to add important technical facts to the mining industry's store of knowledge on more efficient grinding mill operations. We have purposely restricted the subject matter of these ads so that they will be of interest to only one segment of the readers of this magazine—grinding mill operators. And this is right in line with CF&I's policy—*"not merely to sell; but to serve."*

Grinding Ball Rationing of the Makeup Charge

A practical means of improving many grinding mill operations is to determine the optimum size assortment of grinding balls that should be added as a makeup charge.

Increased Milling Throughput Reduces Milling Cost

Total milling cost will *decrease* as number of tons processed (throughput) *increases*. This advantage can be realized in any plant, provided that the rate of mining and all steps in ore processing can be increased to match the greater throughput of the ball mill, which makeup charge rationing makes possible.

Indications That Rationed Charge Is Needed

When a one-size ball addition to a mill is being established, the following conditions may indicate that ball rationing is warranted:

1) There may be a certain amount of tramp oversize that can be reduced by replacing a portion of the balls by a larger size.
2) There may be a crowding of particles of reduced size but not of finished size, showing a deficiency of small-size balls.

When a new mill is started up, time is needed to get the process running smoothly. To add a further problem of determining a makeup ration during this start-up period would be ill-timed.

Ball Wear Pattern

When balls of one size are used for addition, the seasoned charge in the mill ranges from balls of the original diameter to those small enough to purge from the mill. If a screen analysis of the ball charge is made using screens with openings of equal increments, such as ½ inch, the weight of the balls on each screen will show a certain pattern or distribution of the charge by weight. Apparently the rate of wear of different ball sizes in the charge is affected by the size structure of the mill feed and by the crystal size of the minerals. Also, the physical and metallurgical characteristics of the ball may vary with the distance from its center.

There is evidence that there is a difference in the wear pattern of grinding balls of different manufacture. Some appear to be *self-rationing* while others do not. This self-rationing quality, the built-in ability to wear evenly and give longest possible service life, is an important feature of CF&I Forged Steel Grinding Balls. Proper analysis steel, and continuous control and inspection at every stage of production help CF&I to i npart this self-rationing uality to its grinding balls.

Impact, Nipping and Attrition Grinding

Large balls in the charge drop with greater impact and also have a more effective nipping action on the larger particles. Small balls make a greater number of contacts (since there are more of them), so that attrition grinding is more effective. Fine crushing is increased due to greater nipping action incidence on the small particles. Ball rationing is employed to change the size distribution of the ball charge to one that has a better ratio of impact, nipping and attrition.

Not All Mills Should Attempt Ball Rationing

Most small mills, and some of the larger ones, do not have the facilities to blend mine run ore for mill feed. With a great variation in character of feed, establishing even an optimum single-size ball charge may be a difficult problem. Facilities, personnel, and sufficient time may not be available for careful testing. The cost of such an effort may not be justified. Total savings in dollars and cents, through a relatively minor improvement in grinding practice, will not be as great in a small operation as in a larger one. Nevertheless, it appears obvious that, for many operations, the attaining of an ideal ball ration can increase the efficiency of milling sufficiently to warrant the effort involved in its development. Other pertinent factors will be discussed later in this series.

For a reprint of the article on which this ad is based, please write on your company letterhead to: Mining Supply Department, The Colorado Fuel and Iron Corporation, P. O. Box 1920, Denver, Colorado.

OTHER CF&I STEEL PRODUCTS FOR THE MINING INDUSTRY

CF&I Grinding Rods · CF&I Grader Blades · CF&I Industrial Screens
CF&I Mine Rail and Accessories · Wickwire Rope · CF&I Rock Bolts

FORGED STEEL GRINDING BALLS
THE COLORADO FUEL AND IRON CORPORATION
5822

Albuquerque · Amarillo · Atlanta · Billings · Boise · Boston · Buffalo · Butte · Chicago · Denver · Detroit · El Paso · Ft. Worth · Houston
Kansas City · Lincoln (Neb.) · Los Angeles · New Orleans · New York · Oakland · Oklahoma City · Philadelphia · Phoenix · Portland
Pueblo · Salt Lake City · San Francisco · San Leandro · Seattle · Spokane · Wichita

Now for air legs! a removable bit that's one-piece strong!

Here is a removable bit for air-leg drills that has the strength of one-piece steels. It's the new Timken® tapered socket bit. The tapered union gives you all the advantages of removability and a strong secure union for use with air-legs.

Because the new Timken tapered bit is removable, you get all these advantages that intraset steels can't provide:

You don't have to throw away the drill steel just because the carbides wear out. You do with intrasets.

You carry a few bits down into the mine instead of a load of steel. You can't with intrasets.

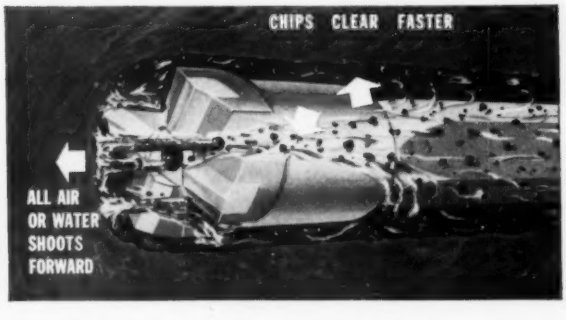
You can quickly change bit gauge sizes using the same steel. You can't do this with intrasets.

You don't have to lug the whole steel back just to resharpen the cutting edges. You do with intrasets.

You get four carbide cutting edges. You get only two with chisel intrasets.

And the new frontal design of the Timken tapered bit gives you faster chip clearance because 1) new five front holes shoot water or air directly against the rock face and 2) new deeper, wider wing clearance lets chips wash back faster. New special-analysis carbide inserts give superior wear-resistance with added shock-resistance, can be reconditioned many times.

For removability *and* strength, use the air-leg bit of the future. Write for our free brochure. The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable: "TIMROSCO".



TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

AVAILABLE NOW...
THE AIR-LEG BIT OF THE FUTURE

ALONG THE

P&H ELECTRICS ARE WORKING FOR UNITED STATES STEEL

UTAH RANGE

In their iron mining operations in southern Utah, United States Steel's Columbia Iron Mining Company is using *three* P&H 1400 Electrics. You will find P&H Electrics delivering dependable production in mining operations throughout the world.

P&H performance is the result of these exclusive P&H designed and manufactured features:

MAGNETORQUE®... transmits power from the hoist motor to the dipper electro-magnetically for fast action and at the same time, eliminates shock and impact to the hoist gear train and motor. Response is immediate to varying load conditions.

ELECTRONIC CONTROLS . . . P&H designed and built to provide fast action. All motions are smooth, resulting in consistently high output.

It will pay you to choose from the complete P&H line. P&H Electric Shovels from 3½ through 10 cu. yds., P&H power shovels from ½ through 4 yds., truck cranes from 10 through 60-tons. In addition, P&H offers single source service responsibility.

HARNISCHFEGER

Construction and Mining Division
Milwaukee 46, Wisconsin

Longyear mobile rigs moved and set up at new hole in hours

Moving heavy pieces of equipment and erecting tripods is tough work that uses up valuable drilling time. Longyear mobile rigs help diamond drillers avoid this and keep their drills operating more of the time.

Here are three ways Longyear Mobile Rigs save time, effort and money wherever terrain permits their use.

1 Modern steel masts eliminate the need to haul or erect heavy materials for tripods.

2 Pumping unit and other equipment can be mounted on the truck, trailer or jeep, eliminating inconvenient and time-wasting handling.

3 On some truck models, drill and pump may be powered by the truck engine, eliminating the need of separate power units.

Mobile-mounted Longyear drill rigs are engineered to the tough specifications of expert drillers—as are pumps, diamond bits, and all other component parts of Longyear *Coordinated Systems* for diamond drilling.

Write to E. J. Longyear Company, 76 South 8th Street, Minneapolis, for complete details on how Longyear mobile drill rigs can cut costs and save time for you.

E. J. LONGYEAR COMPANY

76 South 8th Street • Minneapolis 2, Minnesota

CANADIAN LONGYEAR, LTD., NORTH BAY, ONT

LONGYEAR, N.V., THE HAGUE, HOLLAND

LONGYEAR ET CIE., PARIS, FRANCE

Diamond Core Drill Manufacturers • Core Drilling Contractors
Mining Engineering and Geological Consultants

Longyear

THE WORLD IS OUR WORKSHOP

In rotary drilling, pulling a 100-ton, two-mile string of drill pipe subjects the drilling line to the terrific stresses imposed by fast acceleration, shock loads, bending and overwinding on drums. Only wire rope with the highest degree of quality in hardness, strength and fatigue resistance can be used, for toolpushers know that . . .

A quality rope is a safe rope

Whether you use wire rope in the field or in a factory, *safety is just as important to you.* When you buy "bargain" rope you bargain with safety. It can cost you more than the pennies you save. Buy on the basis of *quality*—buy Wickwire Rope.

For extra strength—buy Wickwire's Double Gray IWRC extra improved plow steel wire rope

WICKWIRE ROPE
A CF&I PRODUCT

CF&I

LOOK FOR THE YELLOW TRIANGLE

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

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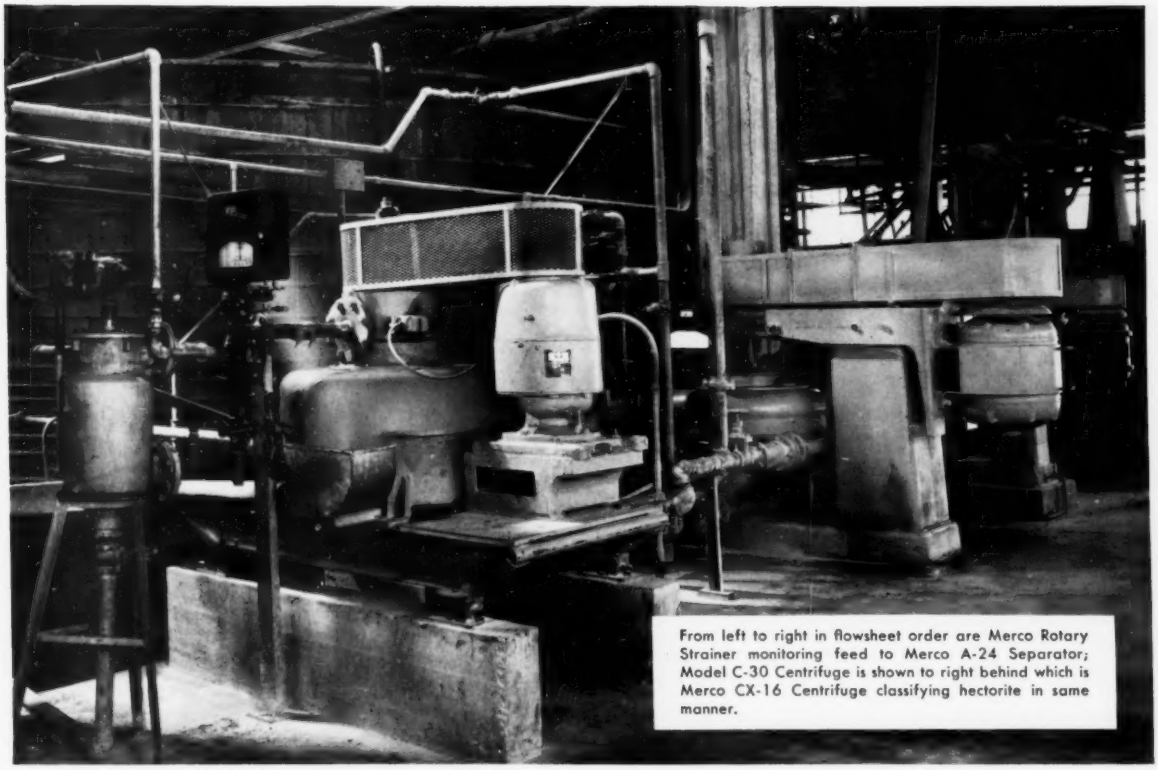
*Subsidiary of Columbia-Geneva Steel Division, United States Steel Corporation.

A Familiar Sign . . . BUCYRUS ERIE *. . . at Scenes of Progress*



From left to right in flowsheet order are Merco Rotary Strainer monitoring feed to Merco A-24 Separator; Model C-30 Centrifuge is shown to right behind which is Merco CX-16 Centrifuge classifying hectorite in same manner.

Merco Centrifugal Classification

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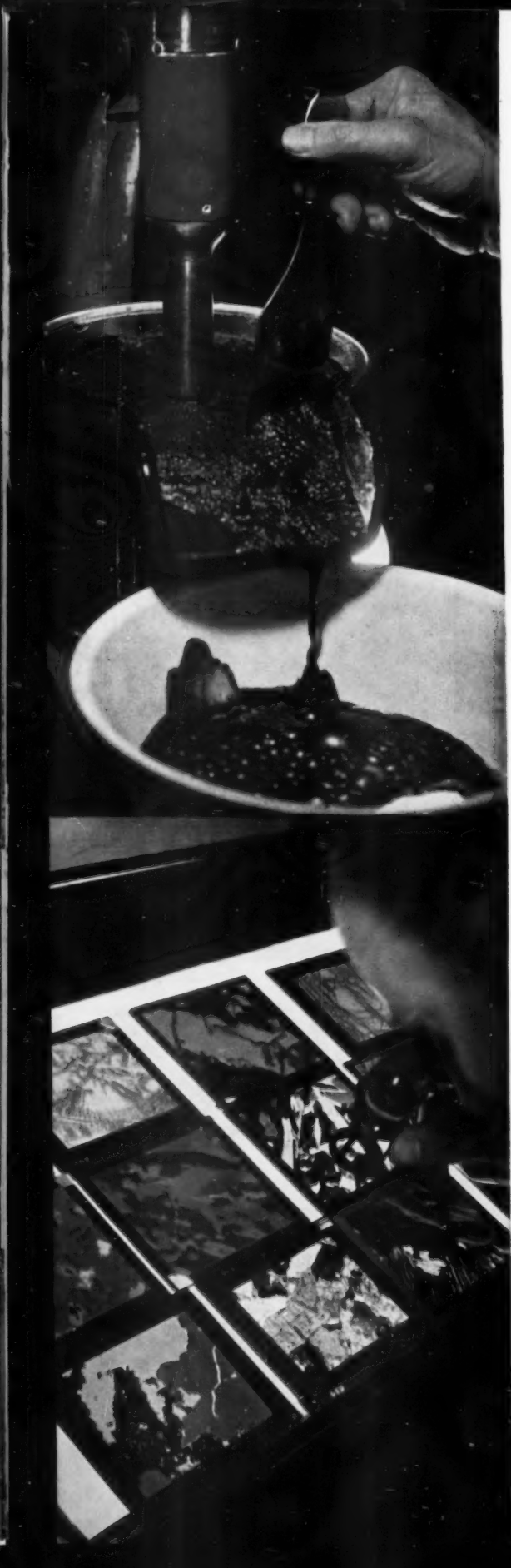

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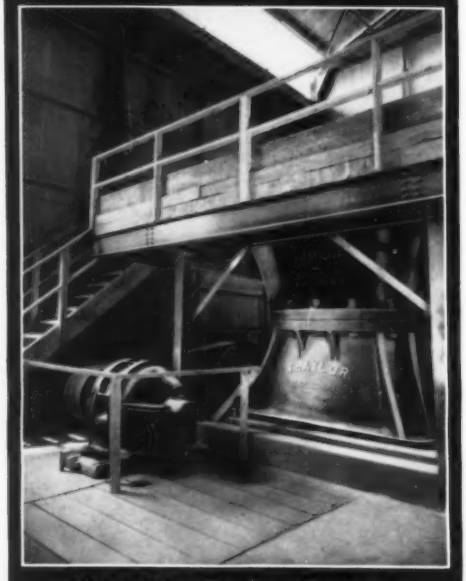
TC GYRATORY CRUSHER



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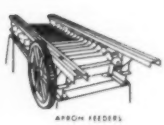


APRON FEEDERS

PRIMARY GYRATORY CRUSHERS

The Engineer's Field Report

CASE HISTORY
RPM Delo Oils
LUBRICANT
Progressive Transportation Co., Compton, California
FIRM

RPM DELO holds piston wear to .001" after 201,253 miles of on-and-off highway hauling

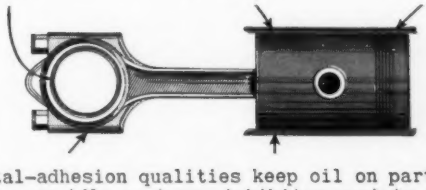
LUBRICATED WITH RPM DELO Oil, these engine parts were pulled from a Cummins HR diesel after 201,253 miles. A portion of this mileage was put on during four months of rugged service spotting loads of heavy pipe in the Arizona desert. When the engine was taken down, after two years of this on- and off-highway hauling, Progressive Transportation Co. found RPM DELO Oil had kept lacquer, gum, sludge, and deposits from forming...rod bearing wear varied between .0005 and .001 inch and pistons showed maximum wear of only .001". No wear at all evident on main bearings. Progressive Transportation uses RPM DELO Oils in all its large fleet of tractors—some of which have traveled well over 200,000 miles without overhaul.

Why RPM DELO Oils prolong engine life

Special compounds stop corrosion

Anti-oxidant resists lacquer formation

Detergent keeps all parts clean



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Mining World

THE IMPORTANT MINING MAGAZINE EVERYWHERE

April 1958

INTERNATIONAL PANORAMA

STARKE, FLORIDA—The DuPont Company has taken over full operation of ilmenite dredging plants and separation facilities at Trail Ridge and Highland from Humphreys Gold Corporation. Humphreys had operated the mines and plants under contract starting in 1948.

SAN FRANCISCO, CALIFORNIA—Production of magnesium in the United States in 1957 reached a peace-time high of 78,865 short tons. Output in 1956 was 68,347 tons.

WHEELING, WEST VIRGINIA—A new company has been formed to make alumina from clays occurring adjacent to coal seams. North American Coal Corporation and Strategic Materials Corporation have formed Strategic North American Corporation to perfect the process. Clay will be mined at Powhatan coal mines.

KITWE, NORTHERN RHODESIA—Costs of producing copper at large African mines in 1957 were as follows: o'Okiep Copper Company, 14.8 cents per pound; Roan Antelope Copper Mines Ltd., 18.8 to 19.5 cents; Mufulira Copper Mines Ltd., 18.2 cents; Rhokana Corporation Ltd., 17.5 to 18.2 cents; Bancroft Mines Ltd., 23.2 cents; Nchanga Consolidated Copper Mines Ltd., 13.8 cents; and Chibuluma Mines Ltd., 15.1 cents.

TEXAS CITY, TEXAS—Wah Chang Corporation will smelt Indonesian tin concentrates here which formerly were smelted in Holland. Wah Chang purchased the federal government's World War II tin smelter in 1957.

NYE, MONTANA—American Chrome Company is building a high carbon ferrochrome pilot plant here to utilize chromite concentrates from the company's Mouatt mine and mill.

BALTIMORE, MARYLAND—Kennecott Copper Corporation has nearly doubled projected capacity of its new electrolytic copper refinery now building near here. The new plant will have a capacity of 16,500 tons when in operation in 1959.

FRANCEVILLE, FRENCH EQUATORIAL AFRICA—Compagnie Miniere de L'Ogooue, controlled by the U. S. Steel Corporation, has called for bids to construct a 280-kilometer railroad to transport high-grade manganese ore to the sea coast in connection with an 80-kilometer aerial tramway.

PORT MUSGRAVE, NORTHERN TERRITORY, AUSTRALIA—Additional large deposits of high-grade bauxite have been discovered on Cape York Peninsula. Aluminium Laboratories Ltd.—subsidiary of Aluminium Company of Canada—made discoveries in Wenlock-Ducie River and Archer River areas.

READING, PENNSYLVANIA—Bethlehem Steel Company has started caving of its first block of ore at the new Grace iron mine in preparation for normal production late this year. Development ore is being stockpiled.

AMOS, QUEBEC—Kennecott Copper Corporation's Canadian subsidiary—Kennco Explorations (Quebec), Ltd.—has negotiated options for claims covering 23,800 acres from the Harricana Prospecting Syndicate. The claims cover geophysical anomalies south of Mattagami Lake. Kennco has also staked about 26,200 adjoining acres.

DJAKARTA, INDONESIA—The Indonesian government has taken over operations of the tin dredges and mines on Banka island. A joint Dutch-Indonesian company, NV Gemmenschappelijke Mijbouw Maatschappij, had operated the mines in recent years.

JOHANNESBURG, UNION OF SOUTH AFRICA—During 1957 South African mines treated 21,624,126 tons of uranium-bearing material and recovered 11,081,546 pounds of uranium oxide. Comparable 1956 figures are 17,967,237 tons and 8,449,259 pounds.

TONOPAH, NEVADA—Round Mountain Gold Dredging Corporation is scheduled to resume milling of gold-bearing placer gravel at its remodeled 250,000 cubic yard per month plant.

Kennecott To Double New Refinery Capacity

Kennecott Copper Corporation has decided to double the planned capacity of its new electrolytic copper refinery being built in Anne Arundel County, Maryland, near Baltimore. Initial monthly capacity will be 16,500 tons of refiner copper instead of 7,000 tons as originally planned.

M. W. Kellogg Company has been awarded the construction contract for the $30,000,000 project. Operation is expected to start in 1959.

An agreement has been reached with the American Smelting and Refining Company which has been doing most of Kennecott's electrolytic refining for many years. A modified and extended five-year contract beginning July 1, 1960 provides that Asarco will refine a minimum of 6,000 and a maximum of 8,000 tons of Kennecott copper per month. Capacity of Asarco's Baltimore smelter is 16,500 tons. Until mid-1960 this will all remain available to Kennecott. Thereafter, the modified contract leaves a maximum of 8,500 tons available to American Smelting for other uses.

COMILOG Accepting Bids For Rail Construction

Bids for construction of a 280-kilometer railway have been called for by Cie. Miniere de l'Ogooue (Comilog), the firm which plans to mine the manganese deposits at Franceville in French Equatorial Africa. The railway would carry the ore from the terminus of an aerial tram to Pointe Noire on the Atlantic Coast.

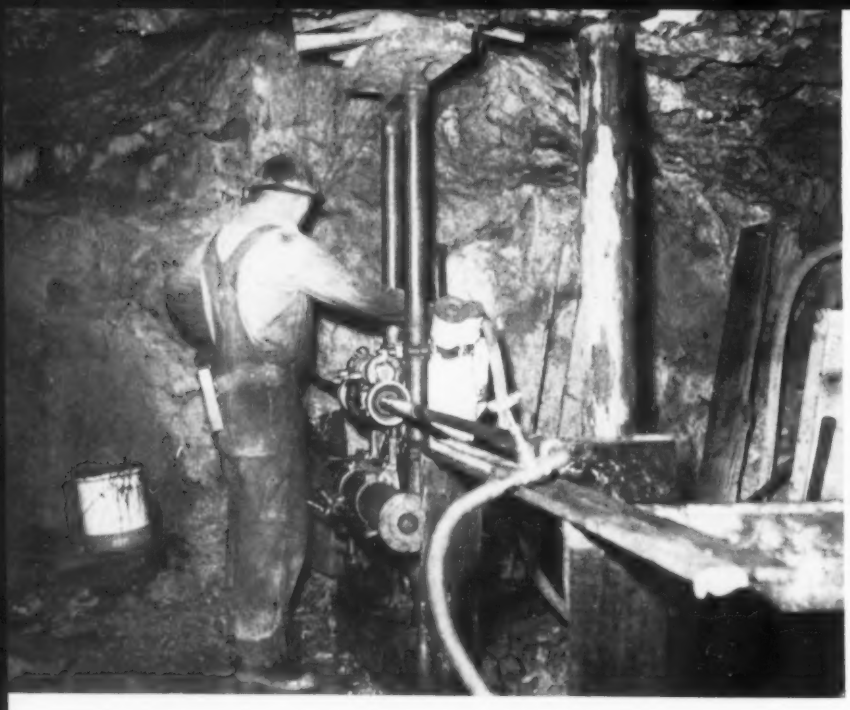
The company increased its capitalization to 2,500,000 African francs a few months ago, and plans to increase it to 11,750,000 African francs by 1961 when large-scale mining is expected to begin. Ore reserves are now estimated at a minimum of 100,000,000 tons with a metal content of 48 to 50 percent Mn.

Five groups have been asked to submit bids for the railway. They are: 1. Societe Nationale des Travaux Publics (France), Safrica (Belgium), Merritt Chapman & Scott (U. S.); 2. Batignolles (France), Morrison-Knudsen (U. S.); 3. Generale D'Entrepises Grands Travaux de Marseille, Francaise de Dragages et de Travaux Publics, Grands Travaux Hydroliques, Regie Generale des Chemins de Fer et Travaux Publics, Generale et Colonies (France), Foley Brothers, Kiewit & Sons (U. S.); 4. Utah Construction (U. S.), Compagnie Industrielle de Travaux-Schneider (France), Taylor (U. K.); 5. Francaise D'Enterprises, Campenon-Bernard (France), Raymond Concrete Pile (U. S.), Impresa Astaldi Estero (Italy).

U. S. Steel Corporation is Comilog's single largest shareholder with 49 percent.

May MINING WORLD Tells Why

DMEA's Long Range Continuance By Congress Mandatory



DIAMOND DRILL probes the 2,100-level footwall at Lucky Friday's silver-lead mine in the Coeur d'Alene District.

Once Labeled Geologically Unfavorable . . .

Lucky Friday Now Has a Bright Future

By STANLEY H. DAYTON
Associate Editor

For the past 15 years people in the Coeur d'Alene mining district have been eyeing enviously (sometimes in disbelief) the remarkable record of Lucky Friday Silver-Lead Mines Company. Lucky Friday operates a small (150-ton-per-day), but high-grade, underground silver-lead mine, 1-mile east of Mullan, Idaho—an area where conditions of vegetation, topography and a layer of unproductive Wallace shales make it difficult to recognize and develop good mines. Its story is a classic case history of the growth of a penny stock company to a full-fledged producer with a bright future.

A deep development program is underway at Lucky Friday, and production will soon be stepped-up to 200 tons daily.

The pattern of mine development was not unusual. It consisted of sinking a few hundred feet, then mining enough ore to justify further sinking. What was unusual was the grade and persistence of the quartz-siderite structure which carries predominantly tetrahedrite and galena mineralization.

Near-surface workings from an adit had disclosed a short isolated stringer many years ago. With depth this stringer widened to 6 to 8 feet and lengthened. Each time the shaft was extended, low-level development proved a longer ore shoot. Grade and width held, too. Take a look at the mill heads which over a year's time in 1956 averaged 17.6 ounces of silver per ton, 9.6 percent lead and 1.1 percent zinc.

The most amazing feature of the mine is the fact that stockholders have never been assessed in order to develop the property. Funds to carry on the work were obtained entirely from private sources—bank loans, working agreements with other companies, loans from company officers, and sale of stock—in spite of the fact that geologic conditions looked less than favorable at the beginning. Through the years the company has maintained 100 percent control of the mine which at one time in its history was sold at a sheriff's auction and at another time was redeemed from the Shoshone County treasurer for the payment of $119.04 in delinquent taxes.

Since 1940 the company has received $8,003,424.43 in net smelter returns and has paid dividends of $1,501,700.85. And growth is still gaining momentum. In 1956, the company received $1,534,663.74 in net smelter returns and showed a net income of $511,297.73.

Depth For 5 New Levels

Last May, Lucky Friday completed a 750-foot shaft extension which marked the first application of the vertical, Cryderman shaft mucker in the district. This project took the opening from the 2,300 sump level to the 3,050 sump level. Today, Lucky Friday can boast a fully developed mine down to the 2,300 level. It can point to a total developed and probable ore reserve of a little over 768,115 tons of 17.9-ounce silver, 8.8 percent lead, and 1.4 percent zinc (17½ years at the present annual production rate of 44,000 tons). Of this total, 285,396 tons is the developed reserve above the 2,450 level; another 482,719 tons is the probable ore below the 2,300 and 2,450 levels where development has not yet been completed. The shaft project provided depth for 5 new levels spaced on 150-foot intervals. Stations for the new levels were cut during the sinking operation.

The ore shoot on the 300-foot level was about 75 feet long; at the 800-

foot level it was 175-feet long; at the 1,400 level it had lengthened to 450 feet; and at the 2,000 level it measured 1,000 feet in length. The 2,300 level is the lowest one completely developed and here commercial ore was exposed over a length of 1,200 feet. The 2,450 level now under development has not been fully prospected to the limits of the structure. But as of January 24, 1957, the 2,450 level had been driven 1,265 feet. Now the 2,600 level is being opened.

The story of the Lucky Friday is not without parallel in mining history. But it is a little unusual in these days of high costs and inflation, particularly in the so-called East Silver Belt of the Coeur d'Alene where surface outcrops are rare. The success of the mine is a direct tribute to a courageous management which sought the funds for development and steered the company along the rocky financial road. The success is also a tribute to the hard working staff, which was called upon to mine and to develop new reserves on a limited budget.

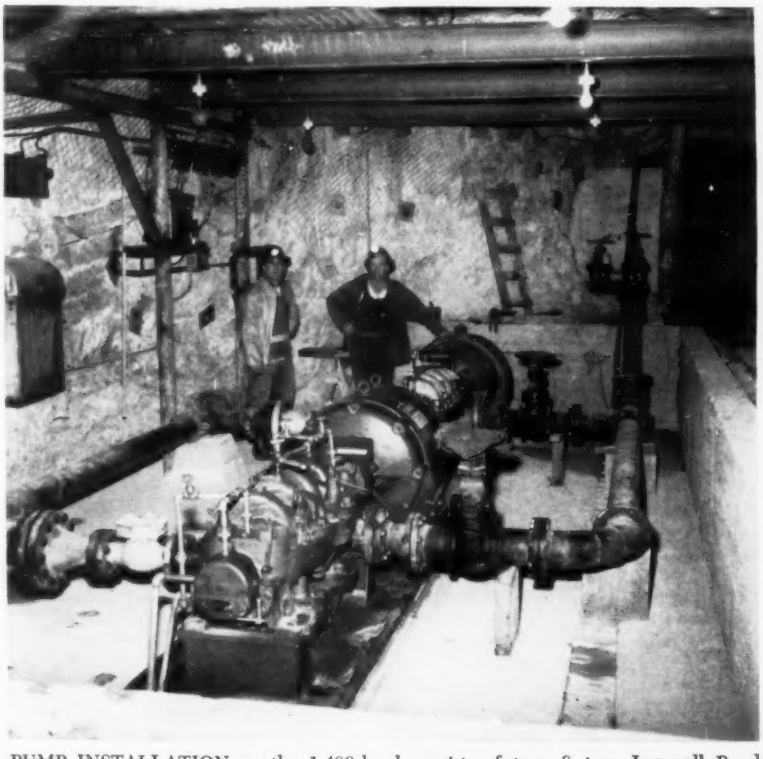
What's Ahead

What of the future? Plans are under way now for construction of a mill on the property starting possibly this summer. At the present time the ore is treated on a custom basis at Golconda Lead Mines' concentrator four miles west of Lucky Friday for $3.00 per ton. A new mill at Lucky Friday should allow the company to cut the treatment cost somewhat and will eliminate a truck haulage cost of $0.71 per ton. A new mill also offers an important hidden advantage. It would provide tailing for a hydraulic backfill plant. Under the present cut and dry-fill stoping method, it probably costs $3.00 to $4.00 per ton to gob the stopes using slushers to spread the material. It wouldn't be unreasonable to expect that hydraulic fill could be placed in the stopes at less than $0.65 per ton for pumping, labor, and stope preparation.

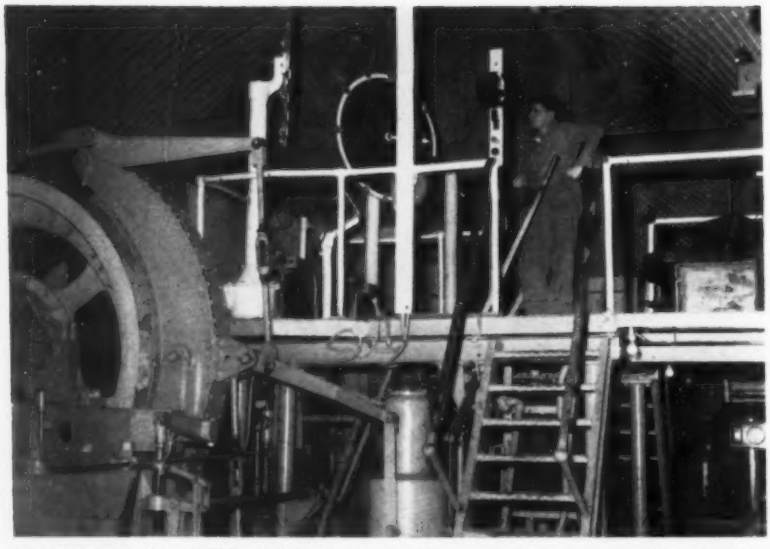
Geology

The country rock of the Coeur d'Alene district is composed of the Belt series of pre-Cambrian rocks. Six stratigraphic units have been identified in the area. Listed in order from youngest to oldest they are the Striped Peak, Wallace, St. Regis, Revett, Burke, and Pritchard. The Striped Peak formation has largely been eroded away and only scattered remnants remain. The Wallace shale is the thickest member of the series; its thickness has been variously determined at 2,500 to 5,000 feet. The Belt series have been intensely folded

A POST is unloaded on the 2,000-level. Sinking operations extended the No. 2 shaft a distance of 750 feet and provides depth for five new levels on 150-foot vertical intervals. Development on lower levels has been encouraging to-date.



PUMP INSTALLATION on the 1,400-level consists of two, 8-stage Ingersoll Rand pumps with combined capacity of 700 gallons-per-minute; one pump is on standby. Man on the right is Dave Elder, mine superintendent; on left is August Voltolini.



UNDERGROUND HOIST ROOM is lined with ¼-inch-thick, corrugated steel plates, bolted together to form an arch. The double-drum hoist was made by Washington Iron Works and is powered by a Westinghouse 400-horsepower motor.

and faulted, a factor which makes detailed mapping extremely complicated. The major structural feature of the district is the Osborne fault, a zone of intense crumpling which trends through the district on an approximate strike of south 75° to 80° east. Most of the known mineralization of the district is associated or related to this structure, or branching shears and faults.

Silver Belt Characteristic

One of the characteristics of the Coeur d'Alene district has been the fact that the stratigraphically young Wallace formation has been relatively unproductive commercially. The shales and argillites of this formation contain considerable lime. The rock is largely incompetent and not conducive to the formation of openings and structural traps for ore. Mineralization where it has been found in the Wallace formation has been very erratic and persists only for short lengths both horizontally and vertically.

It is also characteristic of the district that the St. Regis and Revett quartzites have been the most productive host rocks in the so-called Silver Belt and East Silver Belts. The mine development problem usually resolves itself into sinking through the Wallace if the lower formations are not exposed.

The above was true at Lucky Friday. The upper workings were driven in the Wallace formation. Fortunately through conditions of topography, deformation and erosion, it turned out that the sparse mineralization exposed by these headings was contained in the lower part of the thick Wallace shales. Deeper development soon entered the underlying, more favorable St. Regis formation. The lower mine levels are thought to be in the Revett formation which is even a more favorable host rock than the St. Regis. The isolated little stringer disclosed on the adit level of the Lucky Friday began to bloom into a rich vein with depth (see the description in the box).

Summary of Costs Lucky Friday Silver-Lead Mines Company*

TONS MINED	44,464	
	Year 1956	*Cost per ton*
MINING COSTS:		
Wages	$ 226,899.83	$ 5.10
Supplies	121,798.05	2.74
Light and power	18,387.25	0.41
Insurance—hospital and compensation	17,344.51	0.39
Assaying	1,688.05	0.04
Geology and engineering	6,167.00	0.14
Taxes—property	23,544.57	0.53
Taxes—social security	7,346.71	0.17
Taxes—annual corporation	100.00	
Miscellaneous	3,501.31	0.08
Depreciation	29,142.83	0.66
	$ 455,920.10	$10.26
DEVELOPMENT AND EXPLORATION:		
Wages	$ 64,468.47	$ 1.45
Supplies	47,365.90	1.06
Diamond drilling	3,376.00	0.08
	$ 115,210.37	$ 2.59
MILLING:		
Custom milling	$ 117,458.00	$ 2.64
Hauling ore	31,414.10	0.71
	$ 148,872.10	$ 3.35
OTHER COSTS:		
Officers salaries	$ 15,000.00	$ 0.34
Office expense and salaries	6,501.04	0.15
Telephone and telegraph	565.67	0.01
Legal and auditing	6,680.00	0.15
Insurance—fire	941.43	0.02
Dues and donations	3,839.51	0.09
Miscellaneous	1,500.00	0.03
	$ 35,027.65	$ 0.79
TAXES:		
Federal income taxes	$ 218,226.84	$ 4.91
State income taxes	26,485.83	0.59
Mine license taxes	9,267.92	0.21
	$ 253,980.59	$ 5.71
TOTALS	$1,009,010.81	$22.70

** Costs are higher than normal due to shaft sinking and development to open new levels. These costs, included under development and exploration, could logically be amortized over a long period of time.*

Lucky Friday Vein

The Lucky Friday vein strikes a little north of east. On the lower levels there is a pronounced hook in the vein to the east. At this point it turns nearly due north for a distance of 150 feet and then again turns northeast with a trend more to the north. The dip of the structure is approximately 65 to 70° to the south. At the area where the vein hooks, the dip steepens and reverses. To the east beyond the hook the dip continues at 80 to 85° to the south. The width of the ore shoot has remained quite consistent at 6 to 8 feet. Mineralization in order of commercial value consists of silver, carried by tetrahedrite, closely followed by galena. Minor amounts of sphalerite also occur; in certain areas, the zinc mineral is found in sufficient quantities to add substantially to the value of the ore. The ore minerals are contained in a quartz-siderite vein. Quartz is the predominant gangue mineral.

Two Shafts in Adit

Current mine production is maintained at about 150 tons per day, most of which is hoisted through the No. 2, 3-compartment shaft. The original

or No. 1 shaft is used for limited production from the 2,000 level or above. This latter is a 1½-compartment shaft down to the 100 level. From that point to the 1,000 level it is a 2-compartment shaft. From the 1,000 level to the 2,000 horizon it is a 2½-compartment shaft. The compartments in the No. 1 shaft measure 4 feet by 4 feet inside the timber. This shaft serves primarily for exhaust ventilation.

The collars of both shafts are in the sill of the adit level, and both are served by underground hoists. The adit level is the zero reference point at the mine from the standpoint of depth.

Above the 2,000-foot depth, levels were developed every 200 feet. Below the 2,000, levels are and will be developed on 150-foot intervals. Stoping is done by cut-and-fill method. Stulls are used for temporary support of the hanging wall where needed, and until the dry-fill is placed.

Raise development for stopes is carried out on 100-foot centers. Three-compartment raises were used with the manway in the middle, a timber slide and muck chute making up the other compartments. These raises are pushed through to the next level before actual stoping commences. Every other raise is used for the introduction of the dry fill to the stope from the level above. The alternate raises are used to transfer the ore to the level below the stope.

Mining and Filling

Stoping is done by breasting down in horizontal slices starting from the ore raise. The slice is carried through to the fill raise 100 feet away. Stope rounds are drilled with Gardner Denver airlegs using 7-foot 10-inch lengths of integral Sandvik Coromant steel with tungsten-carbide-tipped chisel bits. Steel with worn bits are cut and rethreaded to receive a new bit and subsequently used with Ingersoll Rand stopers.

Ingersoll Rand air-powered slushers and 30-inch Pacific buckets are used to reclaim broken ore from the stopes and to spread the dry-fill. The raise development is such that the maximum slushing distance for ore and fill is 100 feet. Gob for the stopes is obtained from prospect headings, and normally enough is available to handle the fill requirements. A great deal of the shaft muck from the recent sinking project was used for stope fill. Occasionally if a shortage of fill develops, inclined dog-holes are driven in the hanging wall of the stope to obtain fill.

The dry stope fill sets and hardens quite well when it receives the drill

Lucky Friday: From Stringer to Vein

The mine is located in the East Silver Belt which has been the center of intense deep exploration in recent years, due to the nature of geologic conditions and environment of ore deposition. The property consists of four patented and two unpatented claims. The first claim in the group was located 59 years ago in 1899. Patent on the four claims was granted in 1926. To that time exploration and development had been very limited.

The group in control of the property in 1926 subsequently did a considerable amount of exploratory development. This work consisted principally of driving what is now the main adit opening in a northerly direction from near the southern boundary of the property. The target of this project was to cross-cut the formation and intersect a stringer which had been disclosed in a drift previously driven easterly from a point near the western end line of one of the claims. The target was reached but the vein was only a few inches wide. A short drift was driven to the west on the stringer, but was soon abandoned. The main adit was then continued a few hundred feet to the north without disclosing any mineralization, and the entire project was discontinued.

From 1927 until 1936 the property was idle and the title passed to the county as the result of delinquent taxes. It was redeemed in 1936 upon payment of the $119.04 tax bill. In 1938 John Sekulic, a Mullan, Idaho service station operator, obtained a lease with an option to buy at $15,000. Mr. Sekulic re-opened and re-timbered the main adit, and drove easterly on the stringer at the point of intersection. As before the vein was only one to six inches wide. Failing to interest any of the established mining companies of the district in taking over the lease and exploring at depth, Mr. Sekulic was instrumental in the formation of Lucky Friday Silver-Lead Mines Company. He then conveyed his lease and option-to-buy to the corporation. The lack of interest on the part of the established companies was ascribed to the fact that geologists, at that time, considered the property unworthy of exploration due to its location between the Osborne fault on the south and the White Ledge fault on the north.

Not to be daunted, the corporation authorized the sale of treasury stock for $0.025 in 1939 to obtain funds to sink 100 feet of 1½-compartment shaft from the end of the main adit in the footwall of the structure. The showing at the 100-foot depth was only very little better than on the adit level, but was sufficiently encouraging to arouse the desire to go deeper. Further sale of treasury stock was authorized by the company, but at $0.05 to $0.10 a share, the stock went begging.

Being without funds to continue sinking, the corporation entered into a series of contracts with Golconda Lead Mines. According to these agreements, Golconda and Judge Albert H. Featherstone, then president and manager of Golconda, and his son, John A. Featherstone (now a director and general manager of Lucky Friday), assisted in financing the shaft extension to the 600-foot level.

This phase of development was carried out in stages. The shaft was sunk to the 300-foot level where a 75-foot long ore shoot was mined. Shaft extension from the 300- to 500-foot level and development of the newly opened country, yielded sufficient ore to reimburse Golconda for the last 200 feet of sinking and to continue the shaft to the 600-foot level. By 1944 the shaft had reached the 800-foot level. In 1945, a new hoist was purchased and the shaft deepened to the 1,000 level.

In 1946 working agreements were concluded with Hunter Creek Mining Company which bordered Lucky Friday on the east and Lucky Friday Extension which adjoined Lucky Friday Silver-Lead on the west. The terms called for deep development of the two bordering properties from the Lucky Friday shaft. In return, Lucky Friday Silver-Lead was to share in any ore found, and Hunter Creek and Lucky Friday Extension agreed to finance an additional 400 feet of shaft from the 1,000 to 1,400 level. In 1947, following the latest sinking project, Lucky Friday was engaged in developing the 1,400 level. Production at that time was maintained at 50 to 60 tons per day. Only enough ore was mined to pay for mine development.

In the period between 1947 and the present, the original shaft was extended to the 2,000-foot level. Subsequently, an offset, 3-compartment winze, located about 375 feet south of the No. 1 or original shaft, was sunk from the 2,000 to the 2,300 level. This winze was then raised to the sill of the adit with connections being driven to the No. 1 shaft as the raise progressed. The final stage of sinking was completed in May of 1957 when the No. 2 shaft was sunk from the 2,300 level to its present depth of 3,143 feet below the adit.

AT THE SURFACE a trestle extends over a 6,500-ton capacity stockpile area. A Mancha locomotive and Coeur d'Alene cars shuttle between the skip pocket in the adit and the stockpile. Ore is custom milled at Golconda, about 4 miles to the west.

water during the normal mining cycle. With the addition of water the gob becomes almost like cement. For this reason it has not been necessary to floor the stope with lagging when the ore is breasted down. In practice the top 6 inches of gob is taken along with ore in the slusher lane thus recovering any fines which may have sifted into the fill.

Mine production from stopes is currently originating from the 1,800, 2,150, 2,300 levels. Drifting has not reached the limits of the orebody on the newly opened 2,450 level. When the 2,450, opened for a length of 1,265 feet in January, is developed, the tonnage of ore can easily and will be stepped-up to 200 tons-per-day. The grade of the ore on the 2,450 is comparable with that of the levels above.

All stope production is drawn into 30-cubic-foot Ajax (Coeur d'Alene Hardware & Foundry) mine cars. These side-dump cars are trammed to the ore pocket at the No. 2 shaft station by Mancha 1½-ton battery locomotives. Mucking in drift and crosscut development headings is done with Eimco 12B Rocker-shovels. These headings are driven using Gardner Denver airlegs and 40 percent semi-gel for blasting. A summary of costs at the Lucky Friday is contained in the table accompanying this report.

Hoisting

The No. 2 or main production shaft contains two hoisting compartments and a manway-pipeway compartment. Internal dimensions of each compartment is 58 by 66 inches. The ore is hoisted in 3-ton capacity, Coeur d'Alene Hardware, bottom-dump skips suspended beneath man cages. Each skip-cage combination is positioned against the shaft guides by means of guide shoes, each of which consists of three, small rubber tires under spring-tension. Each of the three tires of the guide shoe set bears against a free face of the shaft guide. Being under spring tension, a smooth skip descent and ascent is obtained which is extremely quiet and free from shock and jarring. The guide shoes were made by Coeur d'Alene Hardware & Foundry.

The ore is hoisted up No. 2 shaft to just above the adit level where two 150-ton capacity skip pockets have been excavated from the rock. The underground hoist for this shaft is located on the adit level in a room which is 40 feet long and approximately 22 feet high from the sill to the top of the arch. The hoist room is lined with ¼-inch-thick corrugated steel plates in rolled sections that are bolted together to form the arch. The hoist is a double-drum unit made by Washington Iron Works and powered by a Westinghouse 400-horsepower motor. Each drum measures 7 feet in diameter by 40 inches wide, and each is wound with 3,550 feet of cable.

The No. 1 shaft is serviced by a 200-horsepower, single-drum, Coeur d'Alene hoist. This shaft has only limited use in regular production work for ore originating above the 2,000 level. Its principal purpose now, other than occasional hoisting or service duty, is for exhaust ventilation from the mine. The main mine fan, a Joy 35,000-cubic-foot-per-minute unit, exhausts air from the No. 1 shaft and puts the No. 2 shaft under positive pressure downward.

The ore dumped in the skip pockets at the adit level is trammed to the portal of the adit by a three-car train of 30-cubic-foot Ajax cars and a Mancha locomotive. The train travels over a trestle above the stockpile which has a capacity of approximately 6,500 tons. Here the cars are dumped and the ore is periodically collected and trucked to the Golconda mill four miles west of the Lucky Friday.

Pumping

The mine normally makes about 180 to 190 gallons of water per minute, most of which originates from the new 2,450 level and down. The final stage of a new pumping installation has been completed on the 3,050 level. This provided the mine with a 2-stage pumping facility with water being delivered from the 3,050 sump to the 1,400 sump and from the 1,400 sump to the surface.

The shaft which extends about 87 feet below the 3,050 level is dewatered by a Model 80 L Flygt submersible sump pump which was purchased for the sinking project. This pump or a standby is permanently installed at the bottom of the shaft about 10 inches above a timber bulkhead. The shaft bottom was lined with the bulkhead to provide a smooth shoveling surface for periodic sump clean-up. The Flygt pump delivers the water to the main lower sump on the 3,050 level. This sump consists of a 210-foot-long crosscut which is 7 by 8 feet in cross section. The down grade end of the heading is dammed with a concrete bulkhead.

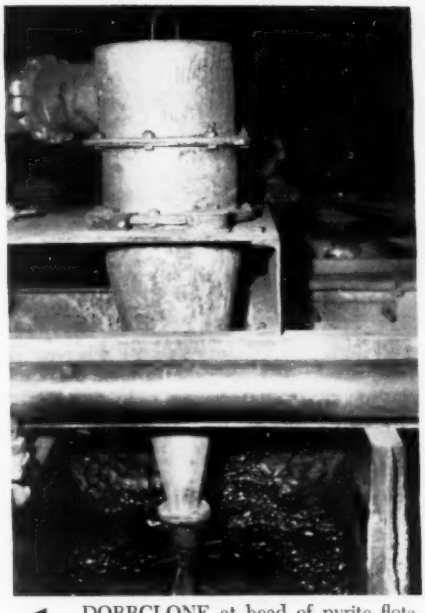
The pump installation on the 3,050 level consists of an Ingersoll Rand 2½ RT pump capable of delivering 400 gallons-per-minute, and a 2 CNT 8 Ingersoll Rand pump rated at 300 gallons-per-minute. Both are 8-stage pumps with one usually on standby. The larger pump is driven by a 300-horsepower motor and the smaller one by a 200-horsepower motor. These pumps operate through automatic electrode controls at the sump.

The pumping installation on the 1,400 level is identical to the one on the 3,050 with the exception that the sump on the upper level measures 300 feet long and is 7 by 6 feet in cross section.

Though it has taken lots of hard work, development at the Lucky Friday has consistently met with success. Through the years it has grown to be one of the important producers in the Coeur d'Alene mining district. Dave Elder is mine superintendent, and Wray Featherstone the engineer at the mine. THE END

Fluxed Concentrate Pumped To Magma's Copper Smelter

Tailored feed for furnace made at mill by pooling flux recovered from tailing with copper concentrate; charge is then adjusted at smelter.



1. DORRCLONE at head of pyrite flotation circuit of Magma's mill, deslimes a portion of the copper scavenger tailing.

By E. J. CALDWELL and HALDER REX

A change in methods of blending siliceous flux with copper concentrate has substantially reduced fluctuations in slag composition and permits Magma Copper Company to treat a more physically-perfect charge in its reverberatory furnace at Superior, Arizona.

Prior to the change, copper concentrates, pumped to the filter plant from Magma's mill, had been fluxed with crushed, minus-½-inch silica. This practice was abandoned in favor of mixing a high-grade silica concentrate directly with the copper concentrate at the mill, and pumping the fluxed pulp ½-mile to the smelter filter plant. The flux is prepared by floating pyrite from a portion of the mill scavenger tailing in a special circuit installed at the mill. The resulting tailing from the pyrite flotation section was ideally suited for fluxing purposes.

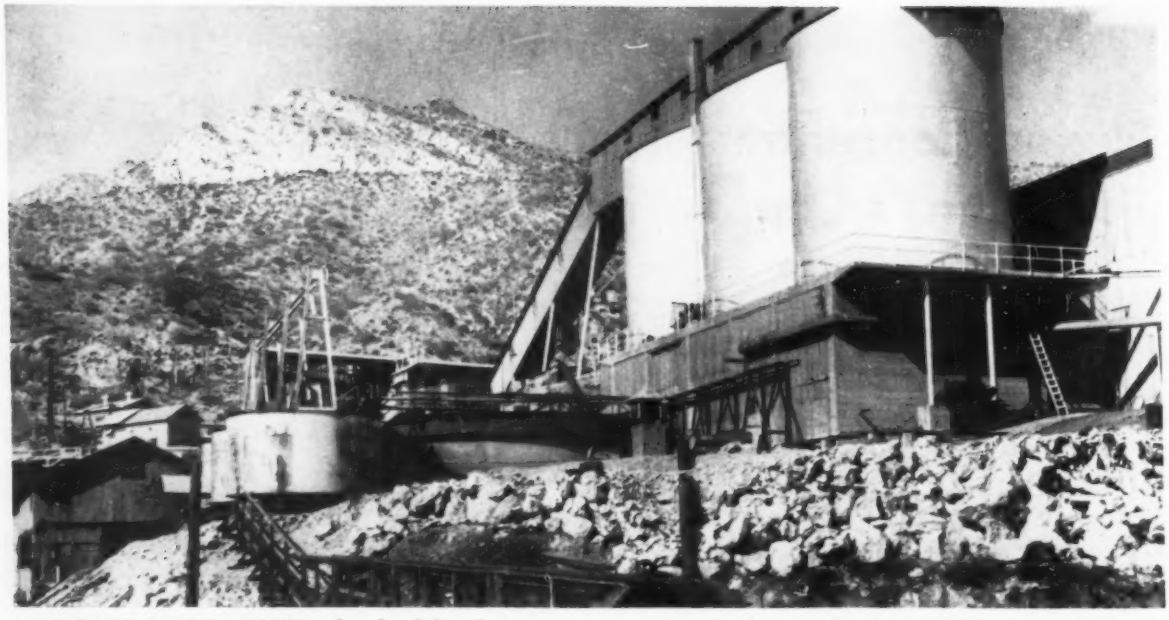
A Segregation Problem

The 22- by 96-foot reverberatory of the Magma Copper Company has been smelting wet charge from the smelter filter plant since July 1949. At that time, the necessary siliceous flux, amounting to over 15 percent of the solid charge, was added to the 800-ton concentrate surge bin directly from the smelter crushing plant. Since the crushing rate was approximately twice the filtering rate, this siliceous flux was literally isolated from the bulk of the concentrate tonnage, and prac-

Mr. Caldwell is smelter superintendent and Mr. Rex is mill superintendent, Magma Copper Company

2. CYCLONE UNDERFLOW is then diluted to 25 percent solids and conditioned with frother and potassium secondary xanthate. The pyrite froth is wasted and the tailing, containing 70 percent silica, is added to the copper concentrate.

3. FLUXED CONCENTRATE is pumped over 2,800 feet to the copper smelter once each day through a 4-inch line. Pulp pumped from mill contains 68 percent solids and could be run to smelter by gravity, but twice the time would be required.



PYRITE FLOTATION TAILING is laundered directly to copper concentrate sump and the blended pulp is pumped to a 40-foot thickener shown at base of mill bins. Storage for daily pumping of pulp to smelter is provided by 3 agitators just to the left of the thickener. Slow sweep arms of the agitators keeps the fluxed concentrate in suspension.

tically no mixing of the two was accomplished. Therefore, there was always some time during the day or night that the reverberatory charge would consist mainly of this siliceous flux which was minus ½-inch in size. Similarly, the furnace charges before and after this occurrence would be nothing but straight concentrate. This gave rise to changes in slag composition from shift to shift although the daily average composition was satisfactory.

In an attempt to better this situation and obtain a more uniform slag analysis, the above practice of fluxing was discontinued, and the flux was henceforth crushed into a bin ahead of the concentrate surge bin. The flux was drawn from this bin by means of a belt feeder operating a predetermined number of minutes per hour of running time. Since this feeder discharged directly onto the belt carrying the concentrate, the desired daily tonnage of flux could then be spread out to cover the entire concentrate filtering time.

This latter method was a decided improvement over the former practice, but there was still some segregation of coarse flux and fine concentrate when the two were discharged into the surge bin. The coarse component would collect around the periphery of the bin leaving the concentrate as a "core" in the center. However, belt-feeding the flux to the concentrate conveyor did help to reduce the wide physical variation in type of charge that could be drawn from the surge bin at any time. As a consequence, the latitude of slag changes was substantially reduced.

In the latter part of 1953, test work on the production of a high-grade silica concentrate that could be added to the copper flotation concentrate was successfully completed by personnel at the Magma concentrator. As a result of the test work, a circuit, described later, was set up at the Magma mill to produce the silica flux from a portion of the concentrator tailing. The flux, being finely divided, is mixed with the copper concentrate and pumped to the filtering plant at the smelter. It is, therefore, intimately and thoroughly blended with the concentrate by the time it reaches the smelter.

Typical Concentrate Analyses Before and After Installation of Silica Blending at Magma Mill

Constituent	*Percent Before*	*Percent After*
Copper	25.7	25.4
Iron	27.0	24.0
Calcium Oxide	0.7	0.7
Alumina	1.6	1.4
Silica	3.6	11.5
Sulphur	34.7	29.7

Typical Slag Analysis of Current Reverberatory Slags

Constituent	*Percent*
Copper	0.41
Iron	36.9
Calcium Oxide	3.8
Alumina	5.8
Silica	34.8
Sulphur	—

Control Remains at Smelter

The amount of silica concentrate that is added to the copper concentrate is predetermined, and is slightly insufficient, so that control of slag analysis still rests with the smelter. The quantity of crushed silica, added at the smelter and used for control, is varied as necessary and is based on both observation and analysis of daily reverberatory slag. Control changes are very infrequent, and it is common to go as long as three to four weeks before a minor adjustment may be necessary.

Under these conditions of fluxing, the amount of crushed silica used for control amounts to slightly over 3 percent of the solid charge. The slag analysis is as uniform as can be expected, and what changes in analysis that do occur take place so slowly that proper control is something that is easily exercised.

Flux Preparation

The flowsheet of the flux preparation section of the mill is shown in the accompanying diagram. The feed to this circuit comes from scavenger tailing of one of the three copper flotation sections of the concentrator. Briefly, the tailing is de-slimed in a 12-inch cyclone. The underflow is conditioned for pyrite flotation, and the froth is wasted. The tailing makes up the flux.

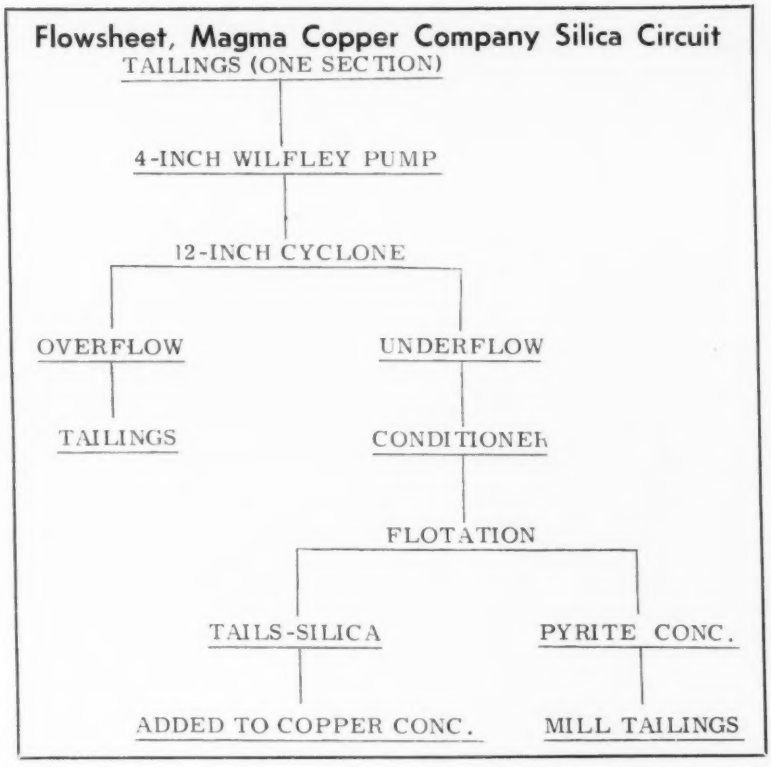
The table indicates the operation of the cyclone. A steady volume of feed

to the cyclone is obtained by adding fresh water, controlled by a float valve, at the cyclone pump-sump. The amount of underflow is measured by weighing the pulp and changing the size of the orifice manually.

As the underflow is discharged into the conditioner, water is added to dilute the pulp to 25 percent solids. No attempt is made to control the pH; the mill circuit on copper flotation operates at a pH of about 10.0. Reagents added at the conditioner are M1BC frother and potassium secondary butyl xanthale (Z8). The resulting silica flux, obtained from the pyrite flotation-tailing, assays 70 percent silica, 14 percent iron, and 0.14 percent copper. The iron content of the flux is composed principally of hematite and magnetite. Visual and chemical analyses show very little pyrite to be present. The silica flux is laundered directly into the concentrate pump-sump, thickened, and then pumped to the smelter filter plant, along with the copper concentrate.

Concentrate Handling

The pooled copper concentrates, averaging 25 percent solids, from the three mill sections, are pumped to a 40-foot-diameter by 10-foot-deep thickener which is powered by a 2-horsepower gear motor. The thickener arms make one revolution in six minutes. Overflow water from the thickener is recirculated to the mill. The concentrate, thickened to about 68 percent solids, is raised by means of a diaphragm pump to a distributing box from which the pulp can be delivered by gravity to any of three 20-foot-diameter by 10-foot-deep agitating tanks that are used for storage. The agitators are each driven by a 7½-horsepower, 440-volt, 1,440-revolution-per-minute motors. The arms revolve at a speed of 5 revolutions per minute, and are run continuously when there is any pulp in the tank.



Pumping to the smelter is usually done once a day, but can be done oftener as smelter storage capacity is limited.

The concentrates and flux are pumped to the smelter filter plant through a 4-inch pipe line by a standard 4-inch centrifugal sand pump which is belt driven by a 50-horsepower motor. The pipe line is 2,894 feet in length and is laid on a 2 percent grade for the first 1,700 feet, to where it joins the old concentrate line. Then it follows a hogback to the filter plant for a total drop of 110 feet. There is onl yone pipe line at present, and it should last indefinitely as previous experience with similar pulp in the old mill showed. No serious operating problems have been encountered.

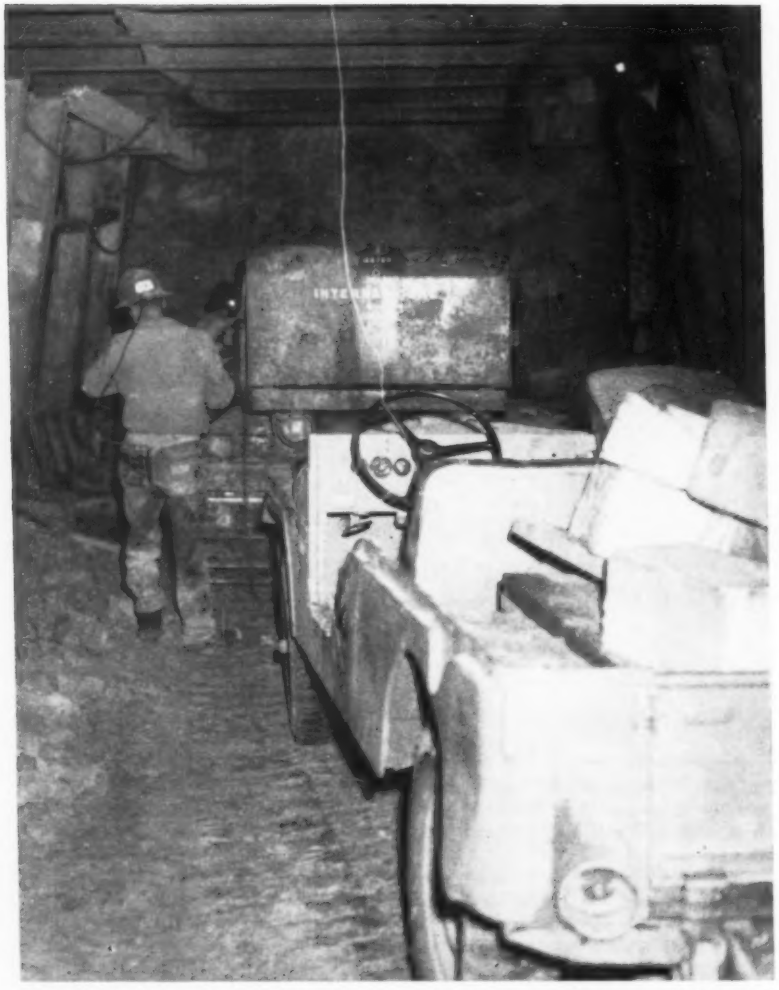
Density of the pulp is maintained at 68 percent solids and contains about 97 percent minus-200-mesh material. Though the fluxed pulp can also be run to the filter plant by gravity, about twice the time is necessary. Also, if the pulp is too thick, 70 percent solids, the line will choke and it becomes necessary to start the pump and flush out the line with water. Present mill practice is to pump all concentrate as soon as possible, so as to leave the pumpman free for other duties. About 125 tons of dry concentrate per hour can be pumped.

THE END

Typical 12-inch Cyclone Performance at Magma Mill

Specific Gravity of Tailing = 3.0

Date	Dia. Inches: Vortex Finder	Dia. Inches: Sand Spigot	Pressure in Lbs./sq. in.	Volume G.P.M. Feed	Solids Tons/Min.: Feed	Solids Tons/Min.: O'Flow	Solids Tons/Min.: U'Flow	% Total Solids in O'Flow	% Solids: Feed	% Solids: O'Flow	% Solids: U'Flow	Size Weight % Feed: +100	Size Weight % Feed: 100-200	Size Weight % Feed: −200	Size Weight % O'Flow: +100	Size Weight % O'Flow: 100-200	Size Weight % O'Flow: −200	Size Weight % U'Flow: +100	Size Weight % U'Flow: 100-200	Size Weight % U'Flow: −200	% Total −100-Mesh in O'Flow	% Eff. at 100-Mesh
2- 8-55	6"	½	16	456.7	0.3440	0.2936	0.0504	85.3	16.1	15.3	70.7	10.4	21.7	67.9	10.3	21.2	68.5	44.4	34.5	21.1	85.4	9.16
9	"	¼	15	308.1	0.2793	0.2267	0.0526	81.2	18.9	17.9	72.0	7.4	18.1	74.5	9.5	18.8	71.7	43.5	34.2	22.3	79.3	—
10	"	¼	15	337.1	0.2856	0.2331	0.0525	81.6	17.6	16.6	71.0	11.5	21.5	67.0	8.0	17.9	74.1	34.9	37.0	28.1	84.8	28.1
11	"	¼	15	553.3	0.6014	0.5990	0.0524	91.3	22.2	18.0	70.4	9.2	17.8	73.0	9.9	18.6	71.5	46.2	30.2	23.6	90.6	—
12	"	¼	9	509.3	0.5891	0.5412	0.0479	91.7	23.4	19.7	68.9	16.1	20.1	63.8	6.3	14.9	78.8	55.1	28.6	16.3	100.0	66.6
14	"	⅜	12	304.1	0.3104	0.2679	0.0425	86.3	21.0	14.1	71.4	8.8	15.2	76.0	10.5	16.7	72.8	50.4	27.2	22.4	84.7	—
15	"	¼	11	340.3	0.3879	0.3469	0.0410	89.4	23.1	18.1	70.4	11.6	18.5	69.9	10.6	18.3	71.1	41.1	29.5	39.4	90.4	8.7
16	"	½	10	422.1	0.5007	0.4500	0.0507	89.9	23.9	19.1	71.3	10.1	18.6	71.3	10.6	17.7	71.7	43.4	31.7	24.9	89.4	—
17	"	¼	11	592.9	0.6276	0.5813	0.0463	92.6	21.7	18.1	70.5	13.3	16.7	70.0	8.2	16.8	75.0	35.4	29.9	34.7	98.4	41.0
18	"	½	8	401.4	0.5053	0.4631	0.0422	91.6	25.1	21.3	70.6	13.2	18.4	68.4	11.4	18.4	70.2	48.6	26.8	24.6	89.6	13.8
19	"	¼	9	313.2	0.3678	0.3318	0.0360	90.2	23.7	19.1	70.7	9.4	19.2	71.4	8.1	16.8	75.1	43.1	29.9	27.0	91.5	13.8
21	"	½	9	341.5	0.4141	0.3678	0.0463	88.8	23.7	18.4	71.1	8.3	17.5	74.2	11.1	20.5	68.4	48.5	29.4	22.1	86.1	—



TIMBERING THE HEADING at Marquez mine. International TD 9 with front end loader is used to raise the steel cap to top of posts. Note how the caps have been boomed ahead of timber. The Diesel-powered Jeep in foreground is used for service.

Success For C&H In U_3O_8

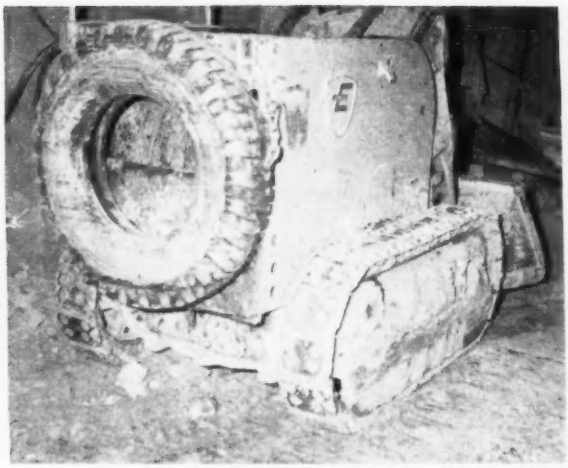
Marquez Mine Developed By Incline

Determination, geological skill, and several hundreds of thousands of feet of drill hole have put Calumet & Hecla, Inc. in the uranium business. Calumet & Hecla, a pioneer Michigan copper producer, has long wanted to diversify its mining interests and in 1954 decided that there were good opportunities in uranium. The geological staff agreed that New Mexico offered excellent prospecting opportunities. So, in 1954, the company secured options from Canoncito Uranium Corporation of Albuquerque and started a $150,000 drilling program on Indian lands approximately eight miles east of Anaconda's Jackpile mine. In 1955, exploration was extended to include a 30,000-acre parcel near the city of Gallup. This land was leased from the Santa Fe Railroad and the Gamerco Coal Company. Almost simultaneously an exploration program, by surface drilling, was undertaken on claims and leases in Section 20, T. 13 N., R. 9 W. east of Haystack Mountain Development Company's Poison Canyon mine.

The most successful of these initial exploration programs was on Section 20 where drilling disclosed a small ore body. Finding this ore, plus observation and evaluation of exploration by other companies, gave Calumet & Hecla's geologists reason to believe that minable ore deposits could be found to the east of the Poison Canyon mine. Accordingly, a lease on the mineral rights for Sections 23 and 13, T. 13 N., R. 9 W. was secured from the Atchison Topeka & Santa Fe Railroad in 1955. At this time, most of Section 24 of this township was leased from Mr. Nabor Marquez, who also held surface rights on Section 23 and 13. Incidentally, the new mine now being developed is named after him.

In 1956 surface drilling started on

MARQUEZ INCLINE is 9 feet high and 13 feet wide inside timbers. Note steel caps. The 24-inch vent line, 4-inch air line, and 440-volt electric cable are hung from back. Incline is lighted for safety and better working conditions.



ELECTRIC POWERED Eimco 630 loader was used for mucking out incline and is now used for loading ore in stopes. The old rubber tire hung on back of machine is used to absorb shock as loader is backed against truck to discharge its load.

Section 23 and a northeast striking fence of drill holes 200 feet apart was drilled near the center of the section. The first 19 holes were blank, but the 20th hole hit ore. Drilling quickly extended the ore found in the discovery hole and in mid-1957 the company publicly announced that it had discovered 500,000 tons of ore.

Determination, geological skill, and perseverance had paid off for C&H. It found a large uranium ore body of good grade.

In addition to the main ore body, at least two other nearby ore bodies have been discovered. Ore depth averages 200 feet below the surface. Average ore thickness is seven feet, but all mining is calculated to nine feet to include dilution.

How Best to Mine Ore?

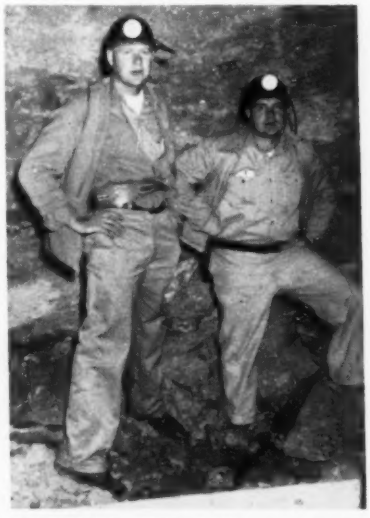
C&H's engineers immediately started studies to determine the best method for mining the ore. Open pitting was strongly considered, but abandoned, one reason being that a creek bed which flows large volumes of water during and after flash floods crossed the necessary pit area. An underground mining plan was adopted.

What was the best method for developing the mine? A vertical hoisting shaft, or an inclined haulage way were both suited because of the size, shape and attitude of the ore body. Both were carefully studied and evaluated.

C&H selected the incline as best for the ore body. This decision was based on favorable company experience in mining somewhat similarly occurring Wisconsin zinc-lead ore bodies.

The incline offers the following advantages: No ore transfer. Ease of supply handling. Centralized equipment maintenance. Flexibility of equipment. Same equipment can be used underground and on the surface. Equipment used for sinking the incline would be immediately available and ideally suited for mining.

The next step was to position the shortest incline that would cut the ore body at its lowest spot, yet maintain a maximum grade of 10° (maximum for effective truck haulage). Drilling results were used to ascertain lowest ore level and a study of aerial photographs was instrumental in picking the collar location. Because of topography and the "dry" creek, it was determined that the best incline would require approximately a 180° curve. The curve would present only minor problems in sinking and truck haulage; disadvantageously, it would preclude the use of a conveyor belt haulage.



CHECKING THE FACE are Randall Weege, geologist-engineer (left), and George McKereghan, manager.

By bottoming the incline at lowest ore point, the following advantages will be gained: all water will drain to central point; major tonnage of ore will be hauled down hill in stopes; early access to and easy development of outlying ore bodies.

How Big the Incline?

Collar elevation, low point of ore, and 10° grade necessitates an 1,800-foot-long incline. Width and height were dictated by dimensions of Eimco 630 loader, a fully loaded Getman truck, state mining laws, and clearance for a 24-inch vent line.

Therefore height would have to be a minimum of 9.0 feet for loader discharge. To allow a safety factor, a standard height of 9.5 feet inside the timber has been carried. Width was determined by the 8.0-foot-wide truck bed plus a 2.5-foot clearance on each side of the truck. Width, therefore, has been carried at 13.0 feet measured 5.0 above the floor.

The company awarded an incentive type labor contract to Farris Mines of Grants, New Mexico, and sinking started in mid-August 1957. By November 7, over 900 feet of incline had been completed. By January 1, 1958 over 1,400 feet had been sunk. The first 800 feet were sunk in the Dakota sandstone. This light, buff-colored, medium-grained sandstone was ideal to drill, shoot, and timber. The underlying Brushy Basin shale and mudstone of the Morrison formation is not as competent a formation so timber sets have had to be placed closer to-

gether which slowed sinking. At 1,800 feet the incline is expected to cut the Poison Canyon sandstone which is the ore-bearing horizon. This formation is expected to stand unsupported over widths greater than 10 feet. Timbering of the main haulage will be continued for safety reasons.

Ground conditions determined timber size and spacing. The first 850 feet is timbered with 6-inch battered posts, each set on a good foot block. Caps are 8-inch, 17-pound, steel I-beams. These sets are six feet apart, lagged with 2-inch plank and carefully cribbed and blocked to back and ribs. At contact of Brushy Basin sets were brought in to three feet, 8- and 10-inch posts were used, and the caps were doubled by welding two steel beams side to side. As the Brushy Basin formation became more competent with depth, set spacing was increased to four feet.

Each steel cap has a box welded on each end into which the top of the post fits to form a strong joint. Steel clips are also welded on the side of each beam four feet from the end. Nails are driven through holes in the clips to hold wooden girts in place between the caps.

Sinking Cycle

Three five-man crews work around the clock. An ideal cycle is a seven-foot round in and out every shift. While three men drill the 36-hole burn cut round, the other two men block timber, clean up, etc. Initially, Airlegs were used for drilling but three machines are now mounted on the deck of a ScootCrete truck to form a jumbo. Both percussion drills using conventional carbide-tipped steel, and air-powered rotary augers are available for drilling. Nature of formation determines which machine to use. Rounds are loaded with 30 percent No. 5 Gelodyn power and blasted electrically. A separate blasting circuit is carried down the incline with all rounds fired from the surface.

After blasting the heading is quickly blown out with a 12,000-cubic-foot-per-minute fan and the same crew goes back to the face where a new cap is boomed ahead off the muck pile. The round is then mucked out with an Eimco 630, loading 6-ton Getman ScootCrete trucks which transport the muck to surface dump. As soon as round is mucked out, posts are placed under the caps, the set blocked and lagged, and the face is ready for another round. A TD 9 tractor with front end loader is used to raise the caps. A Diesel engined Jeep is used to haul timber and supplies to face.

Modern Surface Plant

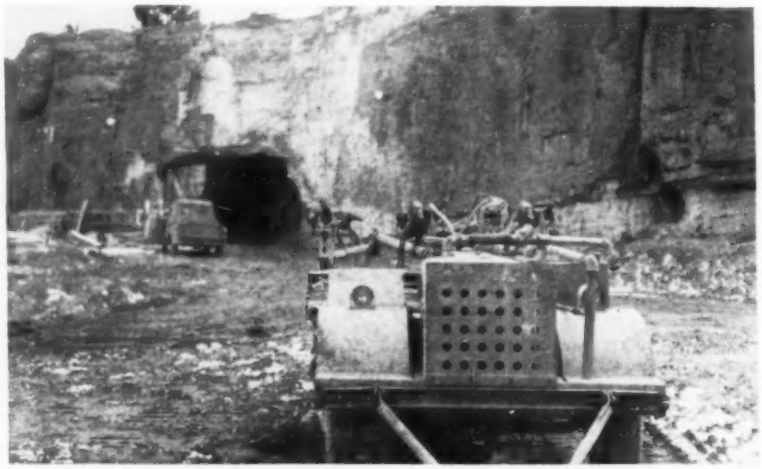
Three pre-fabricated steel buildings have been built on a level area above the portal. The largest houses the office, warehouse, dry, and machine shop. The second is the power house where two Caterpillar D337 Diesel generators are located. Power is used for the mucking machine, lights, ventilation fans, and shop equipment. The third building houses two Joy 800 CFM air compressors, V-belt driven by Caterpillar D337 Diesel engines.

Both the compressor and generator buildings are built so that the north wall slides back to expose a series of air filters that prevent dust or sand from getting into the building while the equipment is operating. Of course, the four Diesel engines and the two compressors each have their own air filter, but the sand does blow in New Mexico.

Manager George McKereghan and office manager John Doyle were transferred from C&H's Michigan copper operations to take charge of the Uranium Division. Mr. Randall Weege is geologist-engineer.

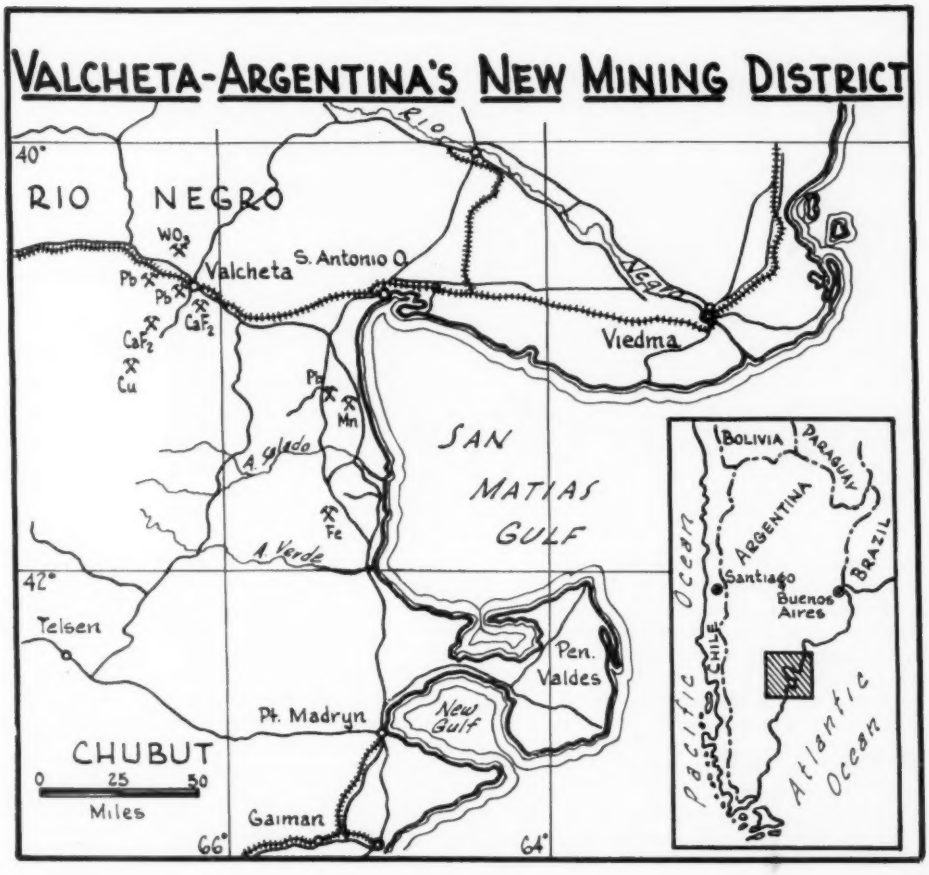
Calumet & Hecla's perseverance has paid off. It is in the uranium business and first ore was shipped early in March from the new Marquez mine. C&H has planned and mechanized for production. It will be one of the larger Ambrosia producers this year.

THE END



INCLINE WAS PORTALLED at cliff base at lowest topographical spot above the ore body, yet high enough above "dry creek" for safety. The drill jumbo in foreground mounts both percussion drills with carbide tipped steel and air-driven rotary augers.

UNLOADING NEW SCOOTCRETE CD-4 Diesel ore truck near the Marquez portal. C and H uses three of these units to haul from the face directly to the ore bins up the 1,800-foot-long, 10° incline. Marquez mine is in southeastern Ambrosia Lake.

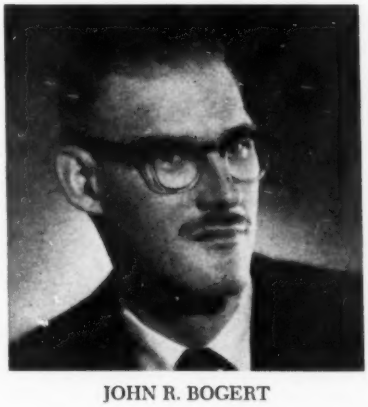


New Argentine District Has Promising Mn, Fe, CaF_2, WO_3, Pb, and Cu Deposits

By JOHN R. BOGERT

A new mining district has rapidly developed in eastern Argentina since the accidental discovery of lead and manganese deposits in 1950. Since that time, fluorspar and tungsten deposits also have been found and mines developed from these discoveries. While manganese has not proved commercial, an interesting copper prospect warrants further prospecting. Of greatest importance, undoubtedly, is the Sierra Grande hematite-magnetite prospect where diamond drilling has indicated 160,000,000 tons of 55 percent iron. The area has only been poorly prospected because there are few rock outcrops and no geophysical prospecting has been carried out. Discoveries to date of such a wide variety of mineralization point to a most promising future.

Mr. Bogert was chief geologist for National Lead Company in Argentina prior to his recent return to the United States.



JOHN R. BOGERT

Until recently nearly all mining in Argentina has been confined to the mountainous regions in the west. From the Bolivian frontier and the famous Aguilar mine of the St. Joseph Lead Company south to recently discovered lead prospects in southern Patagonia, the Andean cordillera and pre-cordillera country has been the center of the Argentine mining industry. Until the early 1950's all of Argentina's metallic mineral production (consisting essentially of lead, zinc, copper, manganese, tungsten, gold and silver) and most of the non-metallic production (sulphur, fluorspar, barite, clays, etc.) has come from this western region.

In 1950, in the Province of Rio Negro near the little town of Valcheta in eastern Argentina, a small lead vein was discovered; at about the

GONZALITO LEAD MINE was discovered by tracing float through sandy overburden. More than 200 tons of lead concentrate are produced per month. Ore is galena and cerussite in a three-foot-wide hydrothermal vein cutting pre-Cambrian schist.

same time, low-grade manganese was discovered further east near the shores of San Matias Gulf, a part of the Atlantic Ocean. These were the first mineral discoveries in this eastern region which has since become a new mining district of growing importance to the Argentine economy.

Geographic Setting

The region around the town of Valcheta is relatively flat and only about 550 feet above sea level. A small chain of hills to the southeast is the only important topographic feature above elevation.

The climate is typical of semi-arid southeastern Argentina. Rainfall is less than eight inches yearly, falling from May to September, and the temperature varies from highs of about 80° F. in the summer (December to March) to lows of about 20° F. in the winter (June to September). High winds are common in the summer.

Water is in short supply in the region. Being close to the ocean, sea water has penetrated the highly fractured rocks and infiltrated far inland. Thus the ground water from wells is salty and not suitable for human consumption. The Valcheta River is the only perennial stream and is the overflow of a shallow spring-fed lagoon 13 miles to the northeast of the town. By careful control, this water supports a narrow strip of lush vegetation some 25 miles long. The town of Valcheta containing about 1,000 inhabitants is in the center of this oasis.

Vegetation in the region beyond the Valcheta valley consists of Patagonian desert brush and occasional clumps of coarse grass. Farming in the valley and goat raising were the sole commercial activities of the inhabitants until the recent mineral discoveries.

Geology

The rocks of the region around Valcheta are basement pre-Cambrian metamorphics that have been intruded by Mesozoic volcanics, capped by Quaternary flows, and covered by recent marine sediments and alluvium.

The oldest rocks of the region, the pre-Cambrian, are a metamorphic complex of gneisses, schists, and phyllites containing abundant mica. Erosion has exposed isolated areas of this formation to the east, south, and west of Valcheta. Mesozoic quartz porphyries, syenites, and granites have intruded the earlier formation and are exposed to the south as are extensive Quaternary basalt flows. To the north and east a capping of recent, unsorted, partially consolidated, coarse water-worn gravels and sands occurs. Most of the region is thinly covered by eolian sands that are accumulating at the present time.

Due to the flat topography and accumulations of surface gravels and sands, rock exposures are relatively rare. This is probably the reason the mineral wealth of this region has remained undiscovered until so recently.

TUNGSTEN VEIN at the San Martin mine has been stoped to surface. Huebnerite is found in quartz veins in granite.

Manganese First Discovered

In 1950, a surveyor doing coastal engineering work along the San Matias Gulf picked up some windblown pieces of hard secondary manganese. This float was traced to a couple of narrow veins of siliceous pyrolusite. After reporting the "find" to his company, proper mining claims were filed and efforts made to discover additional veins. In a short time several dozen were exposed and the company began to mine manganese. Regrettably, all the veins uncovered were narrow and low grade (up to 25 percent manganese) so that soon proved unprofitable. Continued exploration further inland, however, soon turned up a new discovery—lead.

Lead Discovery Important

Some 35 miles west of the San Matias Gulf the first lead was found while searching for additional manganese veins. The lead was first seen as small pieces of float on the surface but a few shallow pits dug through the sandy overburden soon exposed a vein of galena and cerussite over three feet wide. This discovery rapidly developed into the Gonzalito mine which is today producing over 200 tons of lead concentrates a month.

This mine consists of a series of hydrothermal en echelon veins in pre-Cambrian schist that cover a distance of over 2,600 feet. The average width of the veins is about 2.5 feet and they have been developed to a depth of 180 feet. Mineralization consists of much galena, a little sphalerite, pyrite, quartz, and traces of chalcopyrite. Close to the surface some vanadinite has been found along with cerussite. Sampling shows the veins average 36 percent lead, 3.0 percent zinc, and 450 grams silver per ton.

In addition to the Gonzalito mine, several other lead veins have been discovered in the area, the most promising of which seems to be the Tres Marias. This property is some five miles west and has been leased to the present operators who are developing the vein with a deep shaft. All indications point to this mine being as important as the Gonzalito.

While the above discoveries were being made close to the San Matias Gulf, a man in Valcheta was digging post holes to fence in his goat herd.

In one of his holes he turned up pieces of galena. This find was rapidly developed into the San Lorenzo mine. This property is located two miles southwest of Valcheta and consists of two parallel veins about 25 feet apart in syenite. The veins average 12 inches wide containing about 10 percent lead. Two 60-foot shafts sunk in an attempt to locate better ore in depth were unsuccessful. The mine was abandoned in 1952.

At least two other lead veins have been discovered south and west of Valcheta but are probably too small to be of value.

Apparently encouraged by these early discoveries, local prospectors began to search the region in earnest. Within a short time several more prospects of importance were found.

Copper Found in Vein Zones

Twenty-two miles south of Valcheta and about three miles west of the Valcheta River copper was discovered in 1951. The prospect consists of a series of thin, steep-dipping hydrothermal veins in a granite porphyry. The "veins" are actually a series of fine stringers (up to ½ inch wide) that intertwine erratically within a zone varying in width from one to three feet. At least four of these vein zones (30 to 100 feet apart) have been exposed by a series of shallow pits and trenches dug through the sandy overburden. Individually the vein zones do not seem to exceed 100 feet in length. In the partially exposed oxidation zone, mineralization consists of chrysocolla and malachite with traces of specularite, chalcopyrite, and tetrahedrite in a gangue of limonite, quartz, and gypsum. There are no residual limonitic gossans and nothing is known about the occurrence of ore in depth. Samples taken on the surface average 4.0 percent copper.

Fluorspar Discoveries Important

Twenty-six miles northwest of Valcheta a fissure vein of fluorspar was found in 1951. This discovery soon became the Llum Cura mine and was worked until 1955 when the silica content of the ore increased substantially. The vein averages about five feet wide and has a reported length of about 500 feet. It has been developed with a large open stope, a shallow shaft, and several drifts. The grade of ore averages 85 percent CaF_2, and some 6,000 tons of fluorspar were extracted during the four years the mine was in production. Due to increased demand for fluorspar in Argentina, operations are expected to begin again within a short time.

Twenty-five miles southwest of Valcheta several parallel veins of fluorspar were discovered in 1952.

CONCENTRATION MILL at Gonzolita lead mine. High-grade ore which averages 36 percent lead, 3.0 percent zinc, and 450 grams silver per ton is hand sorted with low-grade rejects being crushed, jigged, and tabled to produce concentrate.

The veins occur in phyllite, are steep dipping, and average about two feet wide. Assays of the veins average 69.0 percent CaF_2 and 19.8 percent SiO_2. They have been mined intermittently since their discovery and are now being worked in the surface zone only with extensive pits and trenches.

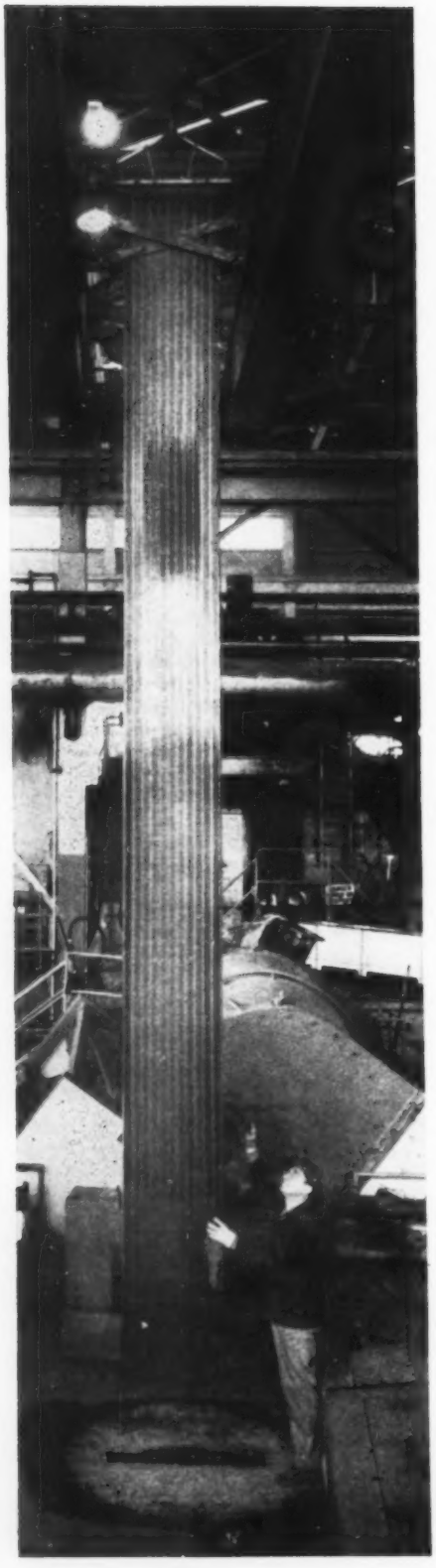
Seven miles southeast of Valcheta, a fluorspar vein was found in 1956 that shows promise of becoming an important producer. This prospect consists of a steep dipping fissure vein in syenite almost a mile in length with an average width of at least four feet. Preliminary surface samples assayed 58 percent CaF_2 with 13 percent SiO_2.

Tungsten Vein Has Long Strike

In 1952, near the Llum Cura fluorspar property, a quartz vein containing huebnerite was discovered by alert prospectors. This fissure vein occurs in a granite stock and is cut by four en echelon cross faults that displace the vein about 75 feet at each fracture. Recent development has shown the vein to have a length of about 3,500 feet and an average width of over two feet. A shaft has developed the vein to a depth of 200 feet. Tungsten mineralization is considered to be mostly huebnerite (the manganese tungstate $MnWO_4$) occurring as small disseminated crystals throughout the vein. Ore values are remarkably uniform and reputedly average 1.8 percent WO_3 for a calculated 45,000 metric tons. Since this first discovery several other smaller tungsten-quartz veins have been found in the area and are all being developed in preparation for mining. A small flotation plant is now being constructed in Valcheta to handle

Continued on page 81

FLUORSPAR has been found in three main areas near Valcheta since 1951. Although veins are narrow, they have a strike length up to one mile. This photograph shows where a series of small pits have yielded high-grade ore by underhand stoping.



WORLD'S LARGEST continuous cast copper cake is hoisted from vertical mold. Copper is cast at 1,150 pounds a minute.

Continuous Copper Cake Casting

Of 25-Foot-Long, 17,000-Pound Units

At Asarco's Perth Amboy Refinery

The world's first commercial unit to continuously cast tough pitch copper cakes—the huge slabs from which copper sheet and strip are rolled—has been installed by American Smelting and Refining Company at its Perth Amboy, New Jersey, refinery. Asarco's new process permits casting of copper cakes up to 25 feet long by 36 inches wide and weighing over 17,000 pounds. Capacity of the new cake casting installation is in excess of 160 tons of copper per eight-hour shift. The process can be used, with minor modifications, for casting cakes of oxygen-free, phosphorized, or other special coppers.

In recent years, many rolling mills, confronted by higher labor costs, have installed larger, faster rolling equipment. But they have not been able to utilize these modern facilities at maximum efficiency and most economically, with the cake sizes available. Longer cakes, ideally only five inches thick, were the real need of most mills since these permit the production of the maximum quantity of sheet and strip per hour with a minimum number of passes through the rolls. Asarco's new cakes meet the needs of the rollers in lengths and widths desired with a five-inch thickness.

The conventional method of manufacturing copper cakes has been to cast them in individual, water-cooled, copper molds. The type of mold customarily used yields a cake 25 to 36 inches wide, 4½ to 7 inches thick, and 36 to 92 inches long. Such cakes weigh between 2,000 and 3,000 pounds. One of the limitations imposed on the size of the optimum quality cakes that can be turned out by old methods is that they must be vertically cast. Horizontal casting is not practicable because the quality of the cake surface, which is of paramount importance to rollers, is impaired.

From Asarco's point of view, to vertically-cast tough pitch copper cakes more than about 37 inches deep by old batch methods is disadvantageous because of the quality deterioration experienced (e.g., from metal splashing).

Mold is the key element of the new Asarco process. It is only 15 inches deep, but it has been designed so that it has a heat dissipation rate of about 1,500 horsepower. This is believed to be the highest heat capacity, per square inch of surface of any mold ever built for either ferrous or non-ferrous casting. The mold solidifies molten copper cast at 2,100° F., as it traverses the 15-inch depth at a speed of up to 20 inches per minute for a 5- by 36-inch cake. This equivalent to 1,150 pounds of copper per minute.

The design eliminates the need for mold preparation compounds such as are used in conventional water-cooled molds. To prevent sticking of the cast copper to the mold, and to ensure a smooth cake surface, the entire mold assembly is oscillated by a reciprocating gear. The vertical stroke is only a fraction of an inch and the variable-speed driving motor can operate up to several hundred cycles per minute.

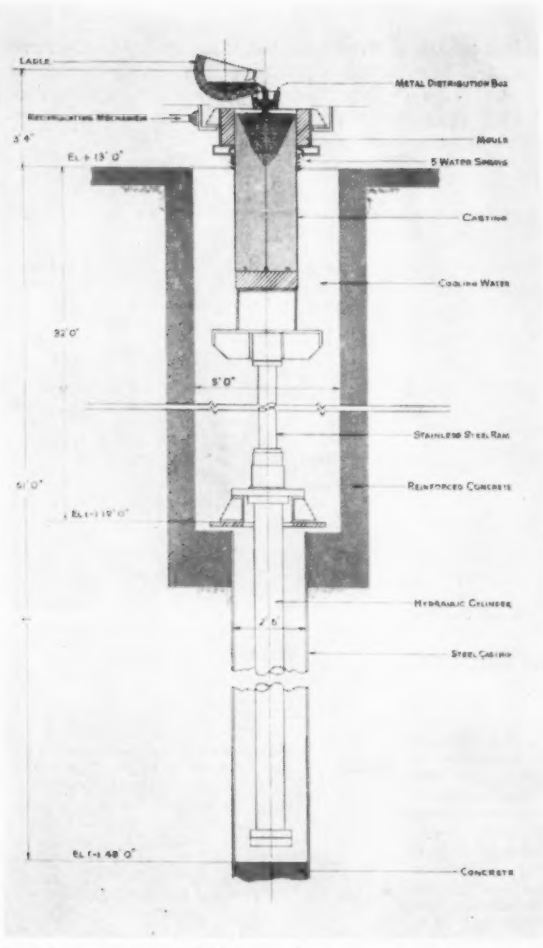
The cake casting unit is the second phase of Asarco's expansion and modernization of its Perth Amboy casting shop. In January, the company installed the world's largest direct arc copper melting furnace there. By June it will have completed construction of new, larger facilities for the continuous casting of copper billets.

All three operations—continuous copper melting, cake casting, and billet casting will be integrated operations.

The furnace has a bath capacity of 90 tons of molten copper and is designed to melt copper cathodes at a 30-ton-per-hour rate. Currently, the 8,000-kva furnace is operating substantially in excess of rated melting capacity.

For the cake casting unit, tough pitch copper flows down a launder from the arc furnace to a 10-ton holding furnace. Metal temperature is adjusted in the holding furnace to 2,100° F. This metal flows, through a special pouring ladle, to the distributor, which ensures a smooth splash-free entry of metal into the mold cavity.

At Perth Amboy, the mold is situated at ground level at the top of a specially constructed, 61-foot-deep, water-filled well (see diagram). As the solid cake emerges from the bottom of the mold it is cooled by a



BELOW SURFACE MOLD and casting pit is key to long length casting. Solid casting is lowered into water filled cooling pit by hydraulic ram as molten copper is added through top of mold.

series of high-speed water-spray jets as it is lowered continuously into the reservoir of cooling water.

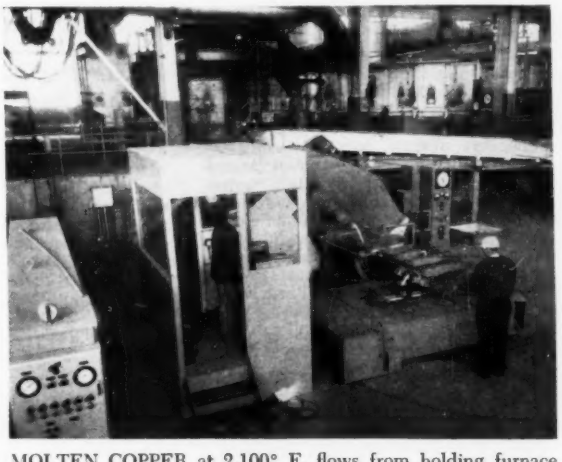
Cooling water is circulated by an 1,800-gallon-per-minute pump. A duplicate standby pump is installed to cut in automatically if the operating pump fails. The heat dissipation capacity of the entire cooling system is rated at 5,800 horsepower; roughly adequate to aircondition a building more than one and a half times the size of the Chrysler Building.

The cake is lowered into the well by a stainless steel hydraulic ram which has a 27-foot stroke. The lowering rate is constant, regardless of the varying weight on the ram. The ram, and its actuating hydraulic equipment, is completely submerged in water. The withdrawal ram, rate of casting of metal, cooling system, and other vital elements of casting are electronically controlled. One operator governs the entire casting operation from the electronic control center located in a booth a few yards from the casting pit.

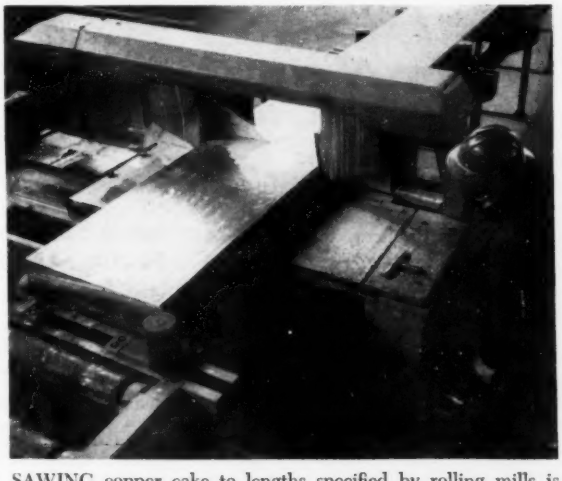
After the cake is cast, the mold is swung to one side and the 25-foot, 17,000-pound cake is lifted by a 10-ton crane to a nearby platform. There it is sawed to the precise lengths which are specified by customer rolling mills. The saw, of unusual capacity, cuts through the cake at a speed of 4 feet per minute.

As it is now installed, the casting shop includes two molds, side by side. The new unit is capable of casting two cakes, at a rate of up to 20 inches each per minute, simultaneously.

CONTINUOUS CASTING takes place in this mold. Copper at 2,150° F. poured in at top is solidified in 15-inch drop to bottom. Mold oscillates to prevent copper sticking.



MOLTEN COPPER at 2,100° F. flows from holding furnace (center) into special pouring ladle and through distributor into top of vertical mold. Arc melting furnace in center background.



SAWING copper cake to lengths specified by rolling mills is done by this high-speed circular saw which cuts through casting at rate of 4 feet per minute.

PRODUCTION EQUIPMENT PREVIEW

PEP is just what new equipment, increased mechanization, and new methods can give to your mine, mill or smelter. This PEP section is MINING WORLD's way of making available to you some of the finest current information on mechanization.

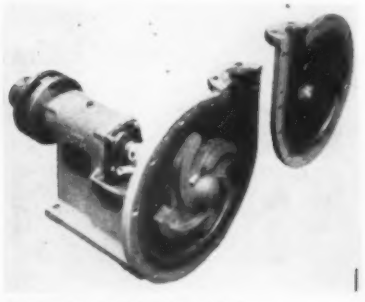
Pneumatic Conveying By Fluor-Hartmann

The design, fabrication and erection of Fluor-Hartmann Conveying, Ash Handling, Dust Removal and Classifying systems for industries on the North American continent is made possible by an agreement between Fluor Products Company and Maschinefabrik Hartmann A.G., Offenbach/Main, Germany.

The entire pneumatic conveying systems available are operated dust-free, as the entire system is completely enclosed. Three basic types of conveying systems are available.

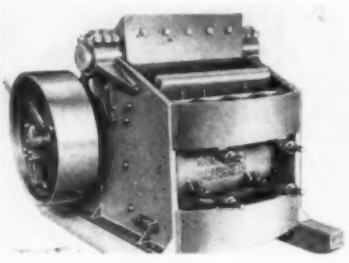
1. Suction System—This system is primarily used to convey materials from several receiving points to a single discharge point.
2. Pressure System—primarily suited to move materials from one feeding point to multiple process or delivery points.
3. Combination Systems—A combination of both pressure and suction systems to do many jobs.

Pressure differential between intake and discharge is produced by rotary piston blowers, water ring air pumps or fans. Additional information on pneumatic conveying, mechanical conveying, dust control and classification systems, may be obtained from Fluor-Hartmann Division of Fluor Products Co., 12000 Washington Blvd., Whittier, California.



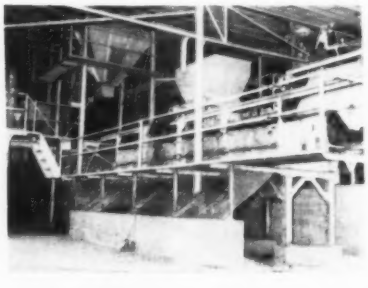
Hypalon Lining Now Standard For D-O Pumps

Dorr-Oliver Incorporated announces the immediate availability of Hypalon lined Olivite and Oliver Diaphragm Slurry Pumps. All presently available sizes of these pumps are now lined with Hypalon synthetic rubber to provide greater resistence than before, to both abrasion and corrosion. This new lining, now standard for the two D-O pumps, replaces the familiar hard and soft Olivite, neoprene and other elastomers which will continue to be available. According to the manufacturer, extensive field tests have proven this material superior to other natural and synthetic materials in its ability to withstand a far wider range of temperatures and chemicals, particularly oxidizing solutions. Write: Dorr-Oliver Incorporated, Stamford, Conn., for additional information.



Rockeater Newest Crusher In Kue-Ken Series

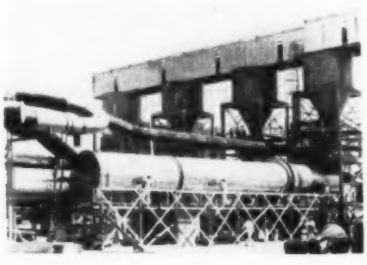
Here is a photograph of the latest Kue-Ken Crusher. Manufactured by Straub Manufacturing Co., 8383 Baldwin St., Oakland 21, California, U.S.A., the new unit is called "Rockeater". According to the manufacturer, the new unit is capable of greater capacities than older models. "Rockeater" units are available in 42-inch by 8-inch, 42-inch by 10-inch, 42-inch by 12-inch, and 42-inch by 14-inch sizes. Capacity ranges from 50 to 125 tons per hour. Weight is 19,800 pounds and 40 to 60 hp is required. For additional information write to the Straub Company at the above address.



Mace Sintering Hearths Feature Low Cost

Low cost of operation and power, as well as simple operation are featured in the Mace Sintering Hearths. Valuable in the flow sheet of any concentrating plant, the sintering process reduces the weight of concentrates by driving off moisture, chemically combined water, sulphur, arsenic, etc.

The Mace Sintering Hearth can be used for agglomerating, blast-roasting, volatilization-sintering and chemical technology such as alkaline fusions of tungsten and vanadium, chloridizing roasts, and calcination of lime. Send for free catalog. Write to: The Mace Co., 2763 Blake St., Denver 5, Colorado, U.S.A.



New Stainless Steel Rotary Calciner

Here's a new Standard Steel Corp. 8-foot by 85-foot rotary calciner built for the U.S. Borax and Chemical Corp. The shell of the calciner is made from 15% type 304 stainless steel clad material and the discharge and feed auxiliary equipment were fabricated from type 304 stainless steel. Sodium Borate Decahydrate is calcined in this unit. For additional information write Standard Steel Corp., P.O. Box 58252, Los Angeles 58, California.

Westfall Performer New to Mining Industry

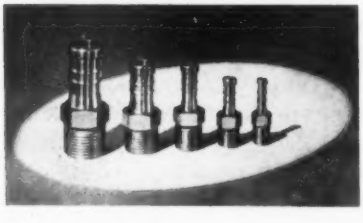
Here's a rugged four-wheel drive with sizes ranging from 200 to 335 hp, that features a 10-foot turning radius, automatic weight transfer, positive four-wheel drive and center-point steering. With the positive four-wheel drive, all four wheels "lock" for constant drive and must turn together providing traction under every situation, regardless of condition or roughness of terrain. Built in weight transfer, contributes to more drawbar pull by transferring the weight from the front wheels to the rear as soon as the load is put on. This provides equal traction on all four wheels under load, boosting the pulling power and maintaining steering ease. For further information on the Performer, write to: Westfall Equipment Co., 437 North Columbia Blvd., Portland 11, Oregon.

Strong Grip and Wear Featured In New Glove

Here's a new work glove said to be tough and provide an outstanding grip, without sweating hands or tiring fingers. This is due to the thousands of tiny plastic dots and the "breathing" action of the fabric between the dots. Manufactured by Riegel Textile Corp., the lightweight glove is said to be long lasting and low in price. Write company at Conover, North Carolina.

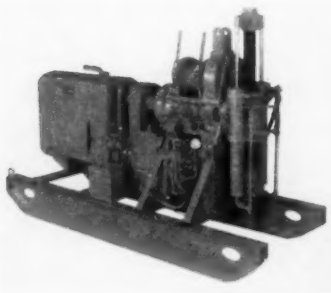
The Largest Aluminum Dump Truck In The World

Built of metal supplied by the Aluminum Company of America, this Mack truck has a capacity of 37½ cubic yards and weighs 27 tons. A special feature of the Heil dump body is the heated dumper floor. Hot engine gases are channeled into the hollow body to facilitate dumping of moist and sticky bauxite. Payload is increased by 11,000 pounds because of aluminum's weight advantage. Write company at 1032 Oliver Bldg., Pittsburgh, Pennsylvania.



Variety Of Hose Nipples From Band-It

Hose nipples made of type 316 stainless steel are now available to mining in five sizes, ¼" x ¼", ⅜" x ⅜", ½" x ½", ¾" x ¾" and 1" x 1" from the Band-It Company. In addition to all the corrosion characteristics of type 316 stainless steel, the new hose nipple is designed to provide maximum flow, greater holding qualities in the hose and extend hose life by minimizing abrasive action of the nipple end. Hose nipples of this design are also offered by this company in 19 sizes of carbon steel and eight sizes in brass. Write company at 4779 Dahlia St., Denver 5, Colorado.



Model "JS" Core Drill Can Use New "W" Rods

The Penndrill model "JS" core drill is designed with a low center of gravity and wide skids to offer maximum stability when drilling in rough terrain. It is powered by a 134 cubic inch 30 hp liquid cooled gasoline power unit and has a 6 volt electric starting system.

Incorporating an integral 20 foot aluminum derrick and optional cathead, the drill is offered with either an "AW" or "NW" 24-inch feed hydraulic swivel head capable of handling the new Diamond Core Drill Manufacturer's Associations "W" series drill rods.

Write to Pennsylvania Drilling Co., 1201 Chartiers Ave., Pittsburgh 20, Penn.

Extra Protection With Rijid-Rib Miners' Pac

This new 10-inch safety pac was developed to offer protection to the foot behind the steel toe box and in the back. Rubber ribs bridging the instep and beefy walls of rubber surrounding the heel give complete foot protection. Even with these added safeguards, the flexibility of the boot is not affected. The new boot is available from Lehigh Safety Shoe Co., Emmaus, Pa. Write to company for further information.

Notes From The Manufacturers

ROBERT CAMPELLO is now vice president and general manager in charge of operations of the Continental Copper & Steel Industries, Inc., Woolridge Manufacturing Division located at Sunnyvale, California. Mr. Campello was formerly employed with the Marion Power Shovel Company as vice president in charge of sales, parts and services. The Woolridge Division manufactures earth moving equipment and self-propelled scrapers.

Atlas Powder Company has established a Toxicology Section in its Chemical Research Department to carry out research on the safety of Atlas products from the standpoint of handling, use, and consumption. These investigations were previously carried on by colleges and research institutions on a contract basis, and some of this work will be continued. **Dr. Joseph F. Treon** is head of the new section.

Donald M. McDowell has been named manager of engineering for the Le Roi Division, Westinghouse Air Brake Company, Milwaukee, Wisconsin. Mr. McDowell joined Le Roi in June 1956, serving as chief development engineer. Since then he has been active in the development of new products for the mining market.

Anthony Anable has rejoined the staff of Dorr-Oliver, Incorporated, as manager of the Technical Data Division in Stamford, Connecticut. For the past few months, Mr. Anable has served as consultant to the Company in connection with completion of a training program for new technical personnel.

Farsi-Moritz Company, 5790 Colorado Boulevard, Denver, Colorado, has been appointed an ESCO mining equipment dealer. A complete line of ESCO equipment includes dragline buckets and repair parts, shovel dippers, hoe buckets, teeth, cutting edges, and other products for the mining industry.

ROBERT G. ALLEN has been elected to a new vice presidency created by Bucyrus-Erie Company, South Milwaukee, Wisconsin excavator and drill manufacturer. Mr. Allen's election, by the board of directors, became effective July 1. He was previously president of the Pesco Products and Wooster divisions of the Borg-Warner Corporation at Bedford and Wooster, Ohio, and was at one time vice president of the Great Lakes Carbon Corporation, New York.

Have you tried SEMI-AUTOMATIC HARD-FACING with STOODY WIRES?

Semi-automatic hard-facing is fast taking hold in all industry! Here's a process that *removes much of the labor of welding* and is 2 to 4 times *faster* than manual application. Weldors can see the weld —wires are fed bare; no submerging flux or flux dams are required. Welding is continuous, feeding from layer wound coils...no stub ends, no lost time changing electrodes. With higher speed there is lower heat input, less penetration of the base metal and reduced dilution of deposits...hence higher wear resistance than with manual electrodes of similar analysis.

WHAT CAN YOU HARD-FACE SEMI-AUTOMATICALLY?

Virtually all large parts now hard-faced manually ...crusher rolls, mill hammers, impact crusher rotors, shovel and tractor parts, tool joints, dredge pump impellers and casings, muller tires, etc.

ASK FOR DEMONSTRATION—Most Stoody distributors (check the yellow pages of your phone book) are equipped to demonstrate Stoody Semi-Automatic Hard-Facing *right on your job!* Ask your distributor to arrange a demonstration today!

STOODY SEMI-AUTOMATIC WIRES—Now available in 11 types for *maximum* wear resistance under *every* wear condition!

See our Booth No. 617 at the Welding Show, April 15-17, 1958

STOODY COMPANY

11932 East Slauson Avenue
Whittier, California

Moving fast, this 123 hp LeTourneau-Westinghouse Adams grader keeps the pit floor clean, blades off loose material. Smooth access roads save wear on haulers' tires. Regular clean-up, improved drainage, prevents refuse from weathering into levels of the pit floor.

9 WAYS

to increase pit output and reduce cost per ton

You may think of your grader simply as a maintenance tool. But in the hands of a good operator, a modern high-speed motor grader actually increases mine and quarry production, and reduces operating costs. Consider these 9 ways in which a grader can help to increase profits:

1 Maintenance of haul roads — Smooth roads speed hauling, save tire wear, reduce hauler downtime, improve safety.

2 Quick clean-up after blast — A grader provides a fast, inexpensive way to move scattered materials back into the shovel zones, thus protecting men, machinery, tires, and other equipment working around the pit, saving time and speeding work operations.

3 Clean pit floors — Your grader can maintain wide, clean traffic ways to make all areas of the pit quickly accessible. Equipment can then travel to any assignment via the shortest route. Regular clean-up, improved drainage, prevents dirt and refuse from weathering into the ore or coal below the pit floor.

4 Maintain good housekeeping around plant — You need ample grader capacity to keep roads, runways, and working areas around the plant neat, clean, and workable at all times. A grader quickly and efficiently levels or removes the occasional spillage from heaped trucks, and from around grizzlies, conveyors, and trestles. A clean plant area reduces dust and speeds mobile equipment operation.

5 Keep stockpile toes pushed in —Weather and loading operations result in the spread of materials around the edges of your stockpiles. This limits working space, wastes stored material. Also, working thinly-spread toes tends to down-grade materials, increases loading costs.

6 Keep dumps smoothly spread and level — Regular grader service can spread material clear over the edge of the dump. Offset blade reaches far out beyond wheels. Level, dry dumps speed hauling and dumping, reduce equipment maintenance. Your grader can easily smooth haul roads as it travels to and from the dump.

7 Clean ore benches of washed-down dirt — Every rain washes dirt into the upper benches and lowers the quality of mined material. Prompt grader service halts this damage, provides planned drainage, piles washed-in material for easy removal by scraper, front-end loader, or shovel and truck.

8 Assist exploration teams — A modern grader can build a well-graded and drained roadway in a matter of hours. It can speed exploration work by maintaining good roads for hauling men and equipment.

9 Keep drainage open—With just a few hours of work each week, a modern grader will keep ditches clean, provide fast run-off, prevent seepage of dirty water into the pit bed. Planned maintenance eliminates erosion of haul roads, keeps trucks and shovels operating on dry ground.

Check capacity of your present grader

It will pay you to reassess the work and capacity of your present graders. If your machines are more than a few years old, you will probably realize a substantial increase in productivity by replacement with modern graders, with large capacities. Write us for full information on the LeTourneau-Westinghouse line of Adams graders, built in seven sizes: 190, 160, 135, 123, 115, 80, and 60 hp. Choose between General Motors or Cummins engines on the 6 larger machines.

This LeTourneau-Westinghouse Adams grader smooths haul roads at speeds to 6.7 mph. The machine levels surface for high-speed movement of big production haulers, travels fast as 26 mph between assignments.

Adams—Trademark AG-1352-M-br

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

United States

Personalities in the News———

SHELDON P. WIMPFEN, former assistant director of the Atomic Energy Commission's Division of Raw Materials and manager of the AEC office in Grand Junction, Colorado, has accepted a position with Western Machinery Company as general manager of the Planning, Research, and Development Department. Mr. Wimpfen was vice president of Glen Alden Corporation, Wilkes Barre, Pennsylvania, before joining WEMCO. He will currently make his headquarters in San Francisco, California.

George R. McGrath is now vice president and assistant to the general manager of the White Pine Copper Company, White Pine, Michigan. Mr. McGrath, who has been with the company since 1955, was appointed plant comptroller in 1956 and elected a vice president in 1957.

John E. O'Neill has been promoted to assistant mine superintendent of Phelps Dodge Corporation's new Cornelia Branch at Ajo, Arizona. **Robert E. West** succeeds Mr. O'Neill as chief engineer.

Murl H. Gidel retired recently after more than 45 years of service with the Anaconda company. Mr. Gidel has served as assistant chief geologist for North America since 1936.

Carl Morris is now assistant chief engineer with Climax Molybdenum Division, American Metal Climax, Inc., at Climax, Colorado. Prior to joining Climax, Mr. Morris operated his own business in Glenwood Springs, Colorado.

James D. Moore, former chief process engineer with Vitro Uranium Company, Salt Lake City, Utah, has been promoted to production manager. In his new position, Mr. Moore will be responsible for all plant operation, engineering and maintenance, and process research and development.

ARTHUR L. BATEMAN, bulldozer operator at Kennecott Copper Corporation's Chino Mines Division, Hurley, New Mexico, receives a $500 award for his suggestion for a bulldozer attachment now in use at Chino. The award was presented by HENRY L. BILLINGS, Mr. Bateman's supervisor. Mr. Bateman's total award under the suggestion system used at Kennecott may amount to several times the initial sum when savings resulting from the idea are computed a year from now.

Grover J. Holt was recently appointed assistant to the president of the Cleveland-Cliffs Iron Company, with offices in Cleveland, Ohio. Mr. Holt was formerly employed as general manager of the mining department with offices at Ishpeming, Michigan.

George W. Streepey has been promoted to assistant general manager of the Aluminum Company of America's mining division, with headquarters in Pittsburgh, Pennsylvania. **Robert S. Overbeck** will succeed Mr. Streepey as division production manager.

J. F. Frost was recently promoted to manager of American Smelting & Refining Company's Western Mining Department in Salt Lake City, Utah. Mr. Frost has served as mining engineer with the Western Mining Department since 1952.

James Q. Penrod is now a member of the research staff of Michigan Chemical Corporation, Saint Louis, Michigan. Mr. Penrod, who was formerly a control laboratory supervisor with the Indiana Ordnance works in Charlestown, Indiana, will undertake development work on rare earths.

Menelaos D. Hassialis, professer of Mineral Engineering and executive officer of Columbia University's School of Mines, New York, New York, was awarded the "Great Teacher Award" presented by the University's Society of Older Graduates.

Dr. Champion Herbert Mathewson, professor emeritus of metallurgy and metallography at Yale University, **Donald H. McLaughlin,** president of Homestake Mining Company in San Francisco, California, and **Fred Searls, Jr.,** chairman of the board of Newmont Mining Corporation, New York, were recently awarded honorary membership to the American Institute of Mining, Metallurgical, and Petroleum Engineers. Citations were presented at the annual AIME banquet held in February.

J. J. Luchessa, mechanical superintendent for the Miami Copper Company, in Miami, Arizona, has retired after 48 years of service with the company. He will be succeeded by **R. P. Hughes,** former chief designing engineer.

Vinton H. Clarke has resigned as vice president in charge of mining and exploration of Howe Sound Company to accept a position with Behre, Dolbear & Company, Inc. of New York. Mr. Clarke has been associated with Howe Sound Company for the past 20 years.

Edgar P. Dunlaevy has been elected executive vice president of Phelps Dodge Copper Products Corporation, a subsidiary of the Phelps Dodge Corporation. Other newly elected vice presidents include **John J. Conlon, William K. Dunbar, Jr.,** and **Earle A. Mitchell.**

Frank Bezzic, mine foreman at Little Beaver Mining Company, Inc.'s Little Beaver mine, has been transferred to the Alice property of Homestake Mining Company at Moab, Utah. Little Beaver is a subsidiary of Homestake Mining Company.

W. D. McMILLAN, Denver, Colorado, mining engineer-geologist, has resigned after 17 years of service with the Department of the Interior, U. S. Bureau of Mines. Mr. McMillan's work has consisted principally of examination, evaluation, exploration, and operation of mines or prospects containing base and precious metals, ferro-alloys, uranium, and non-metallics, including diamonds. He is now associated with two Denver firms as a consultant engineer-geologist.

John Stitzer, mining engineer formerly employed with the Potash Company of America at Carlsbad, New Mexico, and **Mr. Pafford,** of Pafford and Associates, Los Angeles, California, recently purchased the engineering firm of T. N. Stevens and Associates of Tucson, Arizona.

Robert F. Carpenter has been named manager of Republic Steel Corporation's Buffalo district operations. He replaces **Harry H. Northrup,** who is now manager of Republic's Chicago operations.

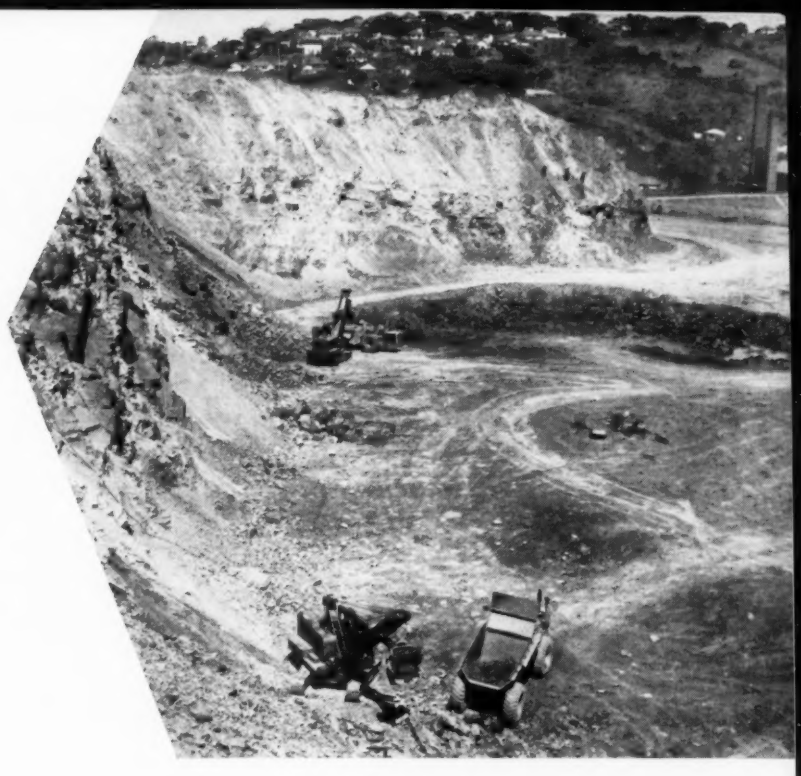
W. L. Albers, former superintendent of the New Jersey Zinc Company's operations at Austinville, Virginia, has been promoted to general superintendent for Virginia. **C. G. Morgenstern,** former assistant superintendent, will assume duties as superintendent.

Albert E. Long, research engineer employed by the U. S. Bureau of Mines' Rare and Precious Metals Experiment Station at Reno, Nevada, has been awarded a superior performance citation and cash award for developing a technique for orienting drill diamonds to take advantage of their hardest parts.

Lemoyne C. Olson, former operating engineer at Inland Steel Company's Armour No. 1 mine, Deerwood, Minnesota, has been promoted to assistant superintendent of the Armour mines.

CHARLES P. READ, a vice president of Heyl & Patterson, Inc., contracting engineers of Pittsburgh, Pennsylvania, receives a commemorative plaque from President HARRY R. EDELMAN, JR., at a testimonial dinner given in honor of Mr. Read's 60 years of continuous service with the company. Mr. Read has made no plans for retirement, but will continue in full time active service with the company.

Mining shale in South Africa for hemisphere's largest brick company



Coronation Brick and Tile Company, of Durban, Natal, Union of South Africa, largest firm of its type in the southern hemisphere, uses two D Tournapull Rear-Dumps and a Tournatractor in its mining work. The firm supplies high quality face and common bricks for most of Natal's building trade. It also provides roofing tile for much of South Africa and Rhodesia.

The 11-ton Tournapulls haul shale, plus some stone and sand, to a feeder leading to the factory. In their spare time, the two Rear-Dumps also haul waste stones and boulders about 2 miles to a dump area.

Meanwhile, the company's 210 hp Tournatractor is assigned to mixing materials for brick and tile. This big tractor-on-rubber dozes select overburden down the quarry face, so shovels at the bottom of the cliff can scoop up some clay along with the shale. On occasion, the Tournatractor also constructs and levels roads, as new parts of the quarry are opened.

Tournapulls move 765 yd daily

When hauling materials to the apron feeder, each shovel-loaded Tournapull delivers 9 yards every 8 to 10 minutes. The two machines move about 10 loads in a 50-minute hour.

Not only are Tournapull Rear-Dumps stronger, and have better loading capacities than competitive haulers on the project, say company officials, but they work much faster. According to records kept for 21 days, each Tournapull delivered an average of 42½ loads of shale daily. Three competitive 4-yard haul units on the job moved an average of 37.6 loads per day.

Says Owner S. M. Fletcher, "LeTourneau-Westinghouse machines maneuver excellently. They are rugged. They are doing a good job for us." Quarry Supervisor H. J. Davies adds, "I have worked on many projects in Africa with LeTourneau-Westinghouse equipment. These machines work better than any other earthmoving product!"

Give excellent service

Each of the Tournapull Rear-Dumps have been used for more than 7,000 hours. The Tournatractor has been used in excess of 5,000 hours. All three machines have given excellent service with an exceptionally good record for availability, say company officials.

Even though Tournapulls haul very large rocks, the big machines withstand loading shocks very well, according to Mr. Davies. Tires have worn especially well, although they are always rolling in hard, sharp shale.

Easier to lubricate

Maintenance is easy, too. Men on the job find lubrication points on LeTourneau-Westinghouse equipment more accessible than on any other machines. Write us if you would like more information on fast rubber-tired LeTourneau-Westinghouse equipment.

Tournatractor dozes special clay overburden toward top edge of cliff, seen in large photo above. At the foot of the bank, material is mixed with shale, and shovel-loaded into Tournapull Rear-Dumps for hauling to the factory.

Tournatractor, Tournapull—Trademark Reg. U.S. Pat. Off.
DRCT-1436-M-1r

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

Newsmakers in International Mining

JOHN D. BRADLEY, president of the Bunker Hill Company, San Francisco, California, returned recently following a three-week tour of mining operations in Australia. Mr. Bradley visited mines, mills, and smelters, paying particular attention to sinter plants and sulphur dioxide processing plants. Included in his tour were Australian Iron & Steel Ltd., Lake George Mining Corporation, Ltd., Broken Hill Corporation, Ltd., and Mt. Isa Mines, Ltd. Mr. Bradley reported to an Australian metallurgist that he was very impressed with what he saw, and plans to send other staff members abroad for similar studies.

John D. Barrington has been appointed president and managing director of McIntyre Porcupine Mines, Ltd., Toronto, Canada, succeeding the late **Frank V. C. Hewett.** Mr. Barrington is also president and managing director of Ventures Ltd., in which McIntyre holds management control. **M. L. Urquhart,** former general manager, has been promoted to vice president of operations, and **S. M. Wedd** has been elected a director of the company.

Stanley Herbert Ward has accepted a position with the Canadian Development & Research Division of the International Nickel Company of Canada. Dr. Ward, who will make his headquarters in Toronto, will work with market development and research, particularly in the industrial chemical field.

D. W. Horwill has been appointed junior engineer for International Minerals & Chemical Corporation (Canada) Ltd.'s potash project in Saskatchewan. Mr. Horwill was formerly employed as mine engineer with the Hudson Bay Mining & Smelting Company at Flin Flon, Manitoba.

John Burgess, Jr., has been named minerals attache of the United States Embassy, Lima, Peru. Mr. Burgess was at one time manager of Representacions Generales, and since 1951 has been an independent mining consultant.

Hank Hosmer, chief geologist for the Cerro de Pasco Corporation, recently returned to the United States after seven years of service in Peru.

J. G. Hamilton, assistant manager of Western Holdings, Ltd., Orange Free State, Africa, has been promoted to manager. He replaces **E. Brown** who is now manager of Western Reefs Exploration and Development Company, Ltd., Union of South Africa.

J. M. F. Phillimore, former assistant manager with the Anglo American Corporation of South Africa, has been promoted to the position of Johannesburg agent for the Rhodesian companies in the Anglo American group.

John Bogert, formerly employed as chief geologist by the National Lead Company in Argentina, has returned to the United States for an extended vacation and is awaiting a new assignment.

Kee Young Chang, president of the Korea Tungsten Mining Company, recently toured mining operations in the United States to inspect and study the present trend and future developments of the mining industry.

B. Bhargava, former Special Officer of Mines for the government at Orissa, India, is now employed with M/S Serajuddin & Company of Calcutta as technical director and is in charge of the establishment and installation of the company's new ferro chrome plant.

L. T. Morgan, formerly chief control metallurgist with Titanium Alloy Manufacturing Company, Ltd. in Cudgen, New South Wales, is now employed as chief metallurgist with Carpco, Australasia Pty. Ltd. at Brisbane, Queensland.

Dr. E. B. Gillanders was recently elected president of Northspan Uranium Mines, Ltd. in Toronto, Ontario, to succeed **J. B. Aird** who has resigned. Dr. Gillanders is also executive vice-president of the Rio Tinto Mining Company of Canada, Ltd., the major shareholders in Northspan.

P. H. Anderson and **T. Reekie** were recently appointed executive directors of Rand Mines, Ltd., Johannesburg, Union of South Africa, and **F. E. Hay** and **R. E. M. Blakeway** were appointed managers. Other appointments include **A. J. Wood** as assistant manager and **A. R. C. Fowler** as assistant consulting engineer.

R. H. Bryson, formerly manager of Loraine Gold Mines, Ltd., Orange Free State, Africa, is now manager of Free State Geduld Mines, Ltd. He will be succeeded by **A. Tennant.**

Allan Botsford, former consultant for the United States government with headquarters in London, England for the past five years, has returned to the United States and is now engaged in private consulting at San Fernando, California. Mr. Botsford served in western Europe, the Near East, and Africa while participating in government programs of exploration, development, and production of strategic minerals for the Defense Stockpile.

Kalervo Raisanen, employed by Vuoksenniska Oy at the Haveri mine, Viljakkala, Finland, has been transferred to the company's central office at Munkkiniemi, Finland.

I. M. Sumonds, formerly empolyed with Cia. Minera de Penoles in Monterrey, Mexico, is now associated with American Metal Climax, Inc. in New York.

H. K. Conn, formerly chief geologist in the exploration department of Canadian Johns-Manville Company, Ltd., Asbestos, Canada, has been promoted to exploration manager for the company. Mr. Conn joined the company as a geologist in 1951 and was appointed chief geologist in 1953.

Paul A. Schafer, vice president and chief geologist of the Philex Mining Corporation, recently returned to Manila, the Philippines, following a business and pleasure trip to the United States.

Professor August Gogala is now a member of the faculty for mining and metallurgy of the College of Mining & Metallurgy at Ljubljana, Yugoslavia. Professor Gogala was formerly associated with the Mining Institute at Belgrade, Yugoslavia.

W. A. Hutchison, general manager of the Phelps Dodge Corporation of Canada, has opened new offices in Toronto, which will serve as headquarters for all Canadian operations. **D. A. Firth** has been appointed chief geologist and will be attached to the Toronto office.

W. D. Lyle, general manager of South African Land and Exploration Company, Ltd., Union of South Africa, has been elected president of the Mine Managers' Association, succeeding **F. C. Steinhobol. E. M. Stewart,** general manager of West Rand Consolidated Mines Ltd., was elected vice president.

A permanent foreign sales and service office, staffed by American engineers, has been opened by the Electro-Technical Labs, in Paris, France. **Gene Florian,** former Mandrel Production manager, is in charge of the office and is assisted by **Les Jasper** and **George Karamberis,** both former design engineers at Electro-Technical Labs in Houston, Texas. Other offices are planned throughout the world, as part of the Labs global expansion.

Jack James, mining engineer for American Metals Company, recently toured the African Copperbelt where his company holds large interest in the Rhodesian Selection Trust Group companies, including Roan Antelope Copper Mines, Ltd., Chibuluma Mines, Ltd., and Mufulira Copper Mines, Ltd.

Dr. Abraham Mitzmager, chief ore dressing engineer for Israel Mining Industries in Haifi, Israel, recently spent three days touring industrial operations in the Lake Superior region in the United States. Dr. Mitzmager's trip was sponsored by the International Cooperation Administration Bureau of Mines Division of Foreign Activities.

LUIS A. NOGALES, Bolivian consulting mining engineer, has returned to the Dominican Republic from Lima, Peru. Mr. Nogales has accepted a position as chief of the Geophysical Exploration Department of Cia. Dominicana de Minerales.

Large Boron Discovery In California Desert

Substantial amounts of colemanite or calcium borate, a boron mineral, have been located on property of the Kern County Land Company in the Mojave Desert of California. Cores have been taken to determine the extent of the deposits, but Ward Smith of the United States Geological Survey has indicated that the reserves will total about 40,000,000 tons.

Drilling to date has indicated only colemanite, $Ca_2B_6O_{11} \cdot 5H_2O$. At the borax deposit of United States Borax and Potash Company only a few miles almost due west, the three sodium borate minerals—tincal, kernite, and ulexite—are found in a large body completely

Place-fix map of boron discovery

surrounded by colemanite. While the sodium borates are more desirable at the present time because of metallurgical processing, Kern County Land engineers are pleased that no sodium minerals have been discovered—the reason being the federal law that reserves sodium borate minerals to the federal government making mineral claims invalid when staked. Much of Kern County's land is held by agreements with local property owners.

Minerals in Industry Theme of AIME Conference

Application of mineral materials in California chemical and process industries was emphasized in the program presented at the 1958 Pacific Southwest Mineral Industry Conference held in San Francisco, California on March 27, 28, 29. A representative crowd attended the meeting, sponsored by the San Francisco section of the American Institute of Mining, Metallurgical, and Petroleum engineers and co-sponsored by the Southern California and Nevada sections.

The three-day session was divided into three divisions, Geology, Industrial Minerals, and Extractive Metallurgy, and 40 technical papers were presented covering nearly all aspects of the use of minerals in California industries.

Guest speaker at the welcoming luncheon held on Thursday was De Witt Nelson, Director of the California Department of Natural Resources, who spoke on "The Importance of the Minerals Industry." Also noteworthy was a paper presented by K. W. Mote, raw materials planning engineer, Columbia-Geneva Steel Division, United States Steel Corporation, San Francisco, entitled "Industrial Minerals Used in the California Steel Industry." "Recent Developments in Columbium and Tantalum Metallurgy" by Dr. Charles D'Ancona Hunt, manager joint-venture melting project, Stauffer-Temescal-Mallory Sharon, Berkeley, California, provoked a great deal of interest as did "The Use of Pyrite and Pyrite-like Ores in the Manufacture of Sulphuric Acid" by V. A. Fink, general chemical division, Allied Chemical & Dye Corporation, Nichols, California.

One of the highlights of the meeting was a 4-hour inspection tour of the 2.5-acre working model of San Francisco Bay, operated by U. S. Army Engineers at Sausalito, California.

Special sessions arranged for the ladies included a tour of the Japanese Tea Garden in Golden Gate Park and a cruise on San Francisco Bay. The meeting was concluded with a dinner dance held at the St. Francis Hotel Friday night.

Fred Lohse of Kaiser Aluminum & Chemical Corporation, Oakland, California, served as general chairman and L. K. Wilson, geologist, American Smelting & Refining Company, San Francisco, was assistant chairman. Program chairman was J. K. Brooke, Kaiser Aluminum & Chemical Corporation.

McFarland and Hullinger of Tucson, Arizona, have resumed mining and milling operations at the *San Xavier* mine and mill, near Sahuarita, Arizona. The mine and mill had been closed down from last June until late in December. Production at the present time is running about 2,000 tons of ore monthly, with one shift of 22 men employed at the mine and 5 men at the mill. The lead concentrates are shipped to Asarco's El Paso Smelter, and the zinc concentrates to Asarco at Amarillo, Texas. Principal production is obtained from six stopes—three on the 740-foot level and one each on the 580-, 660-, and 820-foot levels. Some drifting also is in progress. As the Sahuarita flotation mill has a daily capacity of 300 tons per day, the company is in the market for lead-zinc sulphide custom ores. W. D. Nelson is superintendent, and G. W. Irvin, engineer and geologist.

The *Tungsten Refining Company*, D. L. Whipple, president, is employing a crew of 10 men in its refining operations in Phoenix, Arizona. The company is importing Mexican concentrates which are refined to a purity of 77 to 79 percent WO_3 and shipped to ferro-tungsten manufacturers. Tungsten anhydride also is produced. The company is in the market for low molybdenum (0.80 percent MoS_2) wolframite or scheelite concentrates. The plant is said to have a capacity of 7,500 units of WO_3 per month.

Dasco Mines Corporation, Yuma, Arizona, is producing from 200 to 250 tons of manganese ore daily from the *Doyle* mine. The ore, which averages from 10 to 12 percent Mn, is up-graded at the company flotation mill, near Wenden, Arizona, to approximately 35 percent Mn, then sintered to a 43 percent product. In addition, some fines have been sintered for other producers in the area. The sintering plant treats about 40 to 50 tons daily. Besides top supervisory employes, the Dasco crew totals 30 men as follows: 5 at the Doyle mine, 16 at the mill, and 9 at the sinter plant. The following officers were elected at a recent board of directors meeting: Murphy Wallis, president; Charles Mull, Jr., treasurer; and Harrison Doyle, secretary. Hugh Ergle is superintendent at Wenden.

Miami Copper Company has laid off approximately 390 employes this month. According to General Manager Ben Coil, the layoff is considered necessary because of the low price of copper and the steady increase in operating costs. The cutback will affect operations in the lower grade sections of the *Miami Division* underground mine. No change in operations is scheduled for Miami's *Copper City division*. Miami Copper Company previously had reported a 23.8 percent cut in production from its Miami and Copper Cities operations. The first step in the curtailment program was taken in April 1957 when the work week was changed from seven days to six days; the second step in July 1957 when the work week was cut to five days. Miami's payroll is already down more than 200 from the number employed a year ago.

Plans for the construction of 600 homes on a site midway between Ray and Hayden, Arizona, have been announced by the *John W. Galbreath Development Company*. The townsite, as yet unnamed, is located at a point about 12 miles south of Ray, near the Crescent Ranch on the Gila River. It is designed to relieve a coming housing shortage, the result of the $40,000,000 improvement and expansion program of the *Ray Mines Division of Kennecott Copper Corporation*. Mine officials have indicated that there will be an ultimate need for 500 additional employees when the expansion program is completed. According to Gerald H. Galbreath, Jr., project manager, the homes, all of which will be offered for sale to the public, will be ranch style of three- and four-bedroom varieties. Structures containing apartments will be available for rentals.

American Potash & Chemical Corporation and *Lindsay Chemical Company* have decided to merge, pending approval of the stockholders on April 29. If the merger is completed, Lindsay will be operated as a division of American Potash. Lindsay is the leading producer of thorium, cerium, and rare earth chemicals at its plant at West Chicago, Illinois. American Potash operates plants in Trona and Los Angeles, California, and at Henderson, Nevada, and its subsidiary operates a plant at San Antonio, Texas. Among the diversified chemicals it produces are boron compounds, lithium, rubidium, and cesium compounds.

Two Monterey County prospectors report that they have found a rich gold vein

in a long abandoned mine in the Santa Lucia Mountains near Monterey, California. James B. Pauley of Monterey and Gerald A. Doyle of Seaside have leased the mine with an option to purchase from Art Sherman and Archie Hammond. Formerly known as the *Brewery* mine and now renamed the *Ancona*, the property has been closed for many years. The 34-foot shaft is flooded and skin diving equipment has been used to explore the bottom of the shaft. Old timers in the area speculate that the strike may be on the legendary Madre Beta or Mother Lode of Monterey County.

The *Index-Daley Mines Company* of Salt Lake City, Utah is working on the old *Bullhead* mine on Spruce Mountain near Wells, Nevada. The company now owns 48 patented claims and has a lease and option on the *Eugene Parker* group of six claims on the east side of the mountain. Since February 1956, the firm has completed 1,800 feet of main tunnel under the old Bullhead, and has about 600 feet of long hole drilling and 250 feet of main tunnel completed on the Eugene Parker claims. The mine is reported to be fully equipped with two Diesel compressors, electric plant, electric motor, a two-drill Jumbo, three Gardner Denver loaders, 35 mine cars, and all necessary drilling equipment. The mine was a successful copper, gold, silver, lead producer from 1885 to 1920.

Manganese Inc. is continuing an active search for economic deposits of manganese ore for its flotation plant at Henderson, Nevada. Available ore is expected to be depleted by the end of the year, and the plant will then have to close unless another adequate source is developed by then. Manganese Inc. sells directly to the *General Services Administration* and has two years to go on its contract.

Metals Exploration Company has started production at its *Simpson* and *Stackhouse* mercury mines in Dry Gulch, eastern Pershing County, near Lovelock, Nevada. Work is done from a 400-foot crosscut. Ore will be stockpiled until there is sufficient quantity to supply the 20-ton rotary furnace, and four small retorts. Rush Meadows is in charge of operations.

After several years of preparation, the *Chino Mines Division* of *Kennecott Copper Corporation* has started to mine the *Niagara* ore body in the south pit at Santa Rita, New Mexico. Churn drills were used first for the blast hole drilling and a rotary drill takes over as soon as better access roads are completed. Over $2,000,000 worth of equipment has been purchased for the five-year project. Included are Chino's largest electric shovel, the No. 20; two large electric locomotives and 41 railroad dump cars; seven Euclid trucks; two 1,000-kw rectifiers.

Rare Metals Corporation of America has started to sink its three-compartment uranium shaft at Ambrosia Lake, New Mexico to its depth of 1,000 feet. This will be the most southeasterly shaft and the deepest one to date in the district when it is completed within about 10 months.

Calumet & Hecla Inc. has cut the ore horizon in its Marquez inclined shaft at Ambrosia Lake, New Mexico. Regular ore shipments are now being made to *Homestake-New Mexico Partners'* new mill.

International Minerals & Chemical Corporation has temporarily reduced its work week by 10 percent, resulting in an average 4½-day work week, at its potash division near Carlsbad, New Mexico. Reason for the cutback has been the slowdown in new orders.

A shaft is being sunk by *United Western Minerals Company* on Sec. 8, T. 13 N., R. 9 W. in New Mexico and installation of headframe and mining equipment is also underway.

Potash Company of America, operating at Carlsbad, New Mexico, has completely revamped the warehouse unloading system by installing a new bucket elevator. The new elevator hoists the potash about 70 feet into the air and deposits it on a 45-foot long 24-inch conveyor belt which carries it straight to the hopper bin on the center dock. This new unit cuts two-thirds of the distance the potash had to be carried before.

Reopening of the famous old *Alhambra* mine in the Black Hawk district of Grant County, New Mexico is proceeding satisfactorily. The two-compartment shaft has now been retimbered to 150 feet, and a level at 160 feet has been unwatered. The property is owned by *Leach and Leach* of Lordsburg, and leased to James McGregor of Dallas, Texas. The company owns many properties, including the *Floyd Collins* group in the White Singal district of Grant County. Here torbernite is being developed through four shafts.

Wah Chang Corporation has made arrangements to smelt Indonesian tin concentrates at its Texas City, Texas smelter which it acquired from the government a year ago. The furnaces have been rebuilt to accommodate these shipments which previously were sent to Holland for smelting and then were reshipped as tin metal to the United States. Wah Chang believes it could smelt all of the United States tin requirements; estimates place this at about 60,000 tons annually. From January to November 1957, 24,252 tons of Indonesian tin concentrates were exported, most of this going directly to Holland. The two major Indonesian tin producers have been the *Banka* and *Billiton* groups.

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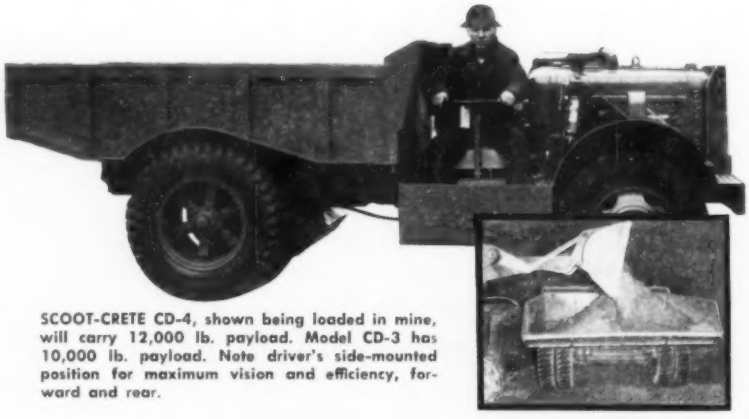

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New AEC Contract Granted To Vanadium Corporation

The Vanadium Corporation of America has signed a new contract with the Atomic Energy Commission for the sale of uranium concentrates processed at the company's mill in Durango, Colorado. The new contract runs from July 1, 1958 to March 1, 1962, and calls for generally lower prices than the present contract.

Vanadium has closed its uranium processing plant at Naturita, Colorado and will consolidate those operations with the Durango plant. The latter will be enlarged to accommodate this. Naturita will continue to have the ore buying depot.

Union Oil Company of California has moved its shale mining operations underground. Until now, shale had been supplied from the open pit north of Grand Valley, Colorado, but this was not considered adaptable to commercial production. *Utah Construction Company* is doing the actual mining for Union Oil. Dr. Tell Ertl is supervisor of mining for Union; Robert Harles is superintendent for Utah Construction. The experimental retort plant was designed to handle 350 tons of shale per day; this was later increased, and it is rumored that plant capacity is now up to 1,000 tons per day.

Climax Molybdenum Company, division of *American Metal Climax, Inc.*, at Climax, Colorado has installed a 300-horsepower ventilation fan in Number 1 Ventilation Drift Lateral Extension to provide fresh air at a comfortable temperature for miners working in No. 2 South Block on the Phillipson Level. Nine feet in diameter, the fan can force 300,000 cubic feet of fresh air per minute into the working areas it serves.

The main objective of the *Leadville Lead and Uranium Corporation* this season is completion of 3,000 feet in the Dauntless Tunnel to the west side of the Mosquito Range. This main underground haulage level has already been driven more than 6,000 feet. By driving it through to the Leadville side of the Range, hauling costs to the ASARCO smelter at Leadville could be reduced considerably. Since last fall, the firm has shipped more than 2,000 tons of lead-silver ore, and current shipments are between 25 and 40 tons per day, six days a week. Along with regular ore shipments, the company is also continuing exploration and development work. At a point several hundred feet from the present production area, and on another level, development work is being conducted to make contact with extensions of the old *Hilltop* mine which was highly productive. Mining in this area was discontinued in the old days because of legal and physical problems, which the present owners have solved through their almost total ownership of the district and with the modern drainage and ventilating system now provided.

Big Horn Uranium & Oil Inc. will absorb the *Gold Hill Mines Company* of Pitkin County, Colorado through an exchange of stock, if company stockholders approve. Big Horn then intends to rehabilitate the Independence Tunnel and to resume lead mining operations. A 25-ton mill is to be installed to determine the best method of milling.

Homestake Mining Company at Lead, South Dakota has installed a new shaft for the Yates cage hoist-drum. Last summer, during a routine reflectoscope inspection, a flaw was discovered in the shaft at a point 108.5 inches from the end. Visual inspection then revealed a large crack. A new shaft was purchased at a cost of $40,000, plus installation charges. Weighing 42 tons, the new hoist drum shaft required 10 days and two 12-hour shift crews for its installation. It is now 25 percent stronger at weakest point than the old shaft.

A $250,000 artificial cryolite plant is to be erected at Garfield, Utah by *United Heckathorn Company* of Richmond, California, if United is able to negotiate a contract with *Western Phosphates Inc.* for purchase of fluorides. The fluorides would be removed from the phosphoric acid circuit at the phosphate plant adjacent to United's proposed site, and mixed with other chemicals to produce about 3,000 tons of cryolite annually. Merwyn D. Riddle is Salt Lake division manager of United Heckathorn and will be in charge of plant operation.

Operation of the *Mystery* and *Sniffer* groups of uranium mining claims near Beaver, Utah has been changed from a partnership. *Mystery Sniffer Mines, Inc.* filed articles of incorporation recently with the Spokane County auditor in Washington State. All of the directors and officers reside in the Spokane area except Wallace R. O'Keefe, Beaver, Utah, president. Last year the properties yielded shipments worth $75,000. Frank Pohlman of St. George, Utah is geologist.

Yucca Mining and Petroleum Company has undertaken diamond drilling work on property of *Greenlite Uranium Corporation* and *Kim Uranium Corporation* at Notom Bench in Wayne County, Utah. Greenlite and Kim own 140 claims in this area, as well as 72 claims near Fruita. Further agreements will be based on Yucca's findings. Intentions are for Yucca's subsidiary, *American Milling Corporation*, to build a milling plant nearby. Greenlite and Kim are both Las Vegas, Nevada firms; Yucca has headquarters in Albuquerque, New Mexico, and American Milling is registered in Delaware.

Through an exchange of stock, *Atlas Corporation* has become a partner in the *Radium King* mine near La Sal in San Juan County, Utah. The assets of an Atlas subsidiary, *Petro-Atlas*, were sold to *American Petrofina*, a former associate in Radium King. As part of the transaction, American Petrofina turned over its 22.7 percent in the Radium King. Also involved in development of the mine are *English Oil Company*, and John M. Wallace, Tom Skidmore, and R. N. Usher. According to J. A. Minton, president of English, the mine produced its regular quota of uranium ore during December 1957, with shipments going to the Mexican Hat mill of *Texas-Zinc Minerals Corporation*.

New Park Mining Company's recent policy of leasing the mine has helped to reduce the firm's losses in the *Mayflower* mine in Utah. Net loss for 1957 was $22,361, compared with $146,024 when New Park operated the mine itself. Some 60 individual lessees are operating the lead-zinc-silver mine under a complicated contract arrangement which provides for a sliding scale payment to New Park based on ore grade.

Kennecott Copper Corporation's Utah Copper Division has made some organizational changes effective March 1. Newly established is the division department of quality control which will be headed by a quality control engineer, yet unnamed. The department will assume charge of present assaying, sampling, and inspection work at the company's mines, mills, and refinery. Previously, these functions were assumed by the operating superintendents. The ore haulage department and the central power station operation have been separated from the mills, and the heads of these sections now come under the direct supervision of the general superintendent of operations. The dump leaching and precipitation plant operation will be set up as a separate department to be headed by a general leaching foreman. The title of general mill foreman has been eliminated and the operations established on a departmental basis with foremen in full-time charge of such principal mill departments as crushing, grinding, and flotation.

Texas-Zinc Minerals Corporation is now processing 800 tons of ore daily at its $7,000,000 uranium mill at Mexican Hat, Utah. The plant handles ore from about 25 mines in the area. Among the many features of this huge project are a 5,000-foot airplane runway which was constructed near the townsite, and a 33-mile road from the mill which connects with other roads leading into the White Canyon mining area.

The name of *Swastika Copper Company*, founded in 1919, has been changed to *Intermountain Resources Inc.* The Salt Lake City, Utah firm was revived last year after 34 years of inactivity. Its major investments are in stocks of other firms, such as *Tintic Standard Mining Company*, *Federal Uranium Corporation*, and *Radorock Resources Inc.*

American Mud & Chemical Company has built a 40-ton-per-day processing plant at Cannonville, Utah to convert bentonite into drilling mud. Actual construction was carried out under contract by *Lym Construction Company* of Salt Lake City. Plans are under consideration for erection of a 150-ton-per-day plant one mile north of Cannonville if bentonite sales are successful. At present the clay is scraped by a bulldozer in an open-pit operation, and deposited in a storage bin awaiting processing.

International Smelting & Refining Company has curtailed operations at its Tooele

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blast furnace because of a shortage of lead ore. Many small independent operations which have been shipping to Tooele have had to suspend operations because of the low prices of lead and zinc. The slag treatment and custom mill will continue operations until a large enough stockpile of lead concentrates warrants relighting of the blast furnace. *United Park City Mines Company's* lead-zinc shipments to Tooele will not be affected.

WYOMING

An easy open winter speeded open-pit mining and mill construction in Wyoming's Gas Hills uranium district. *Western Nuclear* has mined out the *Bull Rush* claims and moved to the *Loma* claims where major stripping began in February.

Fremont Minerals Inc. has taken over operation of the Atomic Energy Commission's uranium ore buying station at Riverton, Wyoming. The station had been operated by *Lucius Pitkin Inc.* First delivery for the proposed 500-ton mill Fremont is building at Riverton was made by *P-C Mining Corporation* from the *Fanny May* mine on *Thunderbird* claims in the East Gas Hills.

Lucky Mc Uranium Corporation's new mill in the Gas Hills district of Wyoming is now in operation.

Columbia-Geneva Steel Division of *United States Steel Corporation* has awarded to the *Bechtel Corporation* of San Francisco the contract for designing the proposed iron ore beneficiation mill at Atlantic City. President L. B. Worthington made the announcement with the usual company word of caution that "a final decision to proceed with the project will not be reached until engineering studies have been completed." Bill Boulette, Sr., and three sons, Bill, Jr., Andy and Vernon, all of Lander, have sold three of seven claims they held on Rock Creek, in the Atlantic City area to Columbia-Geneva Steel Division for $16,500. It is expected that the land will be used for a dam and tailings pond for the proposed beneficiation mill for iron ore on the firm's Atlantic City project.

Modern Mines Development Company has started a 600-foot inclined shaft to open a drilled uranium ore body of good grade on Little Mountain north of Lovell, Wyoming. L. E. Sigman and W. S. Doyle of Yakima, Washington, head the firm.

A uranium upgrading plant will be built in the Little Lightning Creek area south of Lance Creek, Wyoming by *Rocky Mountain Standard Company*, according to board chairman Harry Culver. He said the corporation has leased about 2,000 acres in the area and will begin construction of the plant as soon as sufficient reserves are established to warrant the operation. The plant would employ about 30 men and process about 300 tons of low-grade ore daily.

Phillips Petroleum Corporation reportedly has bought 58 uranium claims in the Shirley Basin area of Wyoming from *Stewart Exploration Company* of Blackfoot, Idaho. Claims are located in Township 28N-78 W, south of Casper.

precipitates—CENTRAL AND EASTERN

Sherwin-Williams Company expects to open new facilities for the production of high-grade barium monohydrate this fall. Construction is underway adjacent to the company's barium carbonate plant at Coffeyville, Kansas. Under a new process, the barium monohydrate will be produced directly from barite with a resultant barium monohydrate of at least 99 percent purity. The *Bunker Hill Company* of San Francisco and Kellogg, Idaho has a 25 percent interest in the new installation. Bunker Hill owns a barite property in Hailey, Idaho, which is currently leased to the *J. R. Simplot Company*.

Lithium Corporation of America in Minneapolis, Minnesota and *Brooks & Perkins Inc.* of Detroit, Michigan, have made a working agreement under which they will participate under joint account in research on alloys containing lithium and other metals. In addition, Brooks & Perkins will prepare special lithium alloys and carry out metallurgical research under contract for the Lithium Corporation account alone. This contract does not affect Brooks' independent work in lithium-magnesium systems which will continue, both independently and in conjunction with Lithium Corporation.

According to the Director of Resources and Development in the state of Missouri, many companies are leasing mineral rights in the state. In addition to the $30,000,000 iron ore development program at Pea Ridge, which *St. Joseph Lead Company* and *Bethlehem Steel Company* are undertaking, he reports that *American Zinc, Lead and Smelting Company* plans to spend $10,000,000 in a test drilling program at Bourbon, Missouri. Last year, American Zinc entered into a venture with *Granite Steel Company* for joint development of any mining properties for the use of both companies.

St. Joseph Lead Company took steps to cut its lead production in Missouri by 6,000 tons. Workers were offered a choice of a three-week vacation shutdown; a four-day week for 15 weeks; or a shutdown of certain high cost areas of the firm's operation. (The company operates in St. Francois, Madison, and Washington counties; its mine in St. Francois County is one of the largest in the world.) Union members voted to accept the three-week vacation. Reason for the curtailment is the "piling up of a seriously large and costly inventory, with foreign producers selling lead in this country well under market prices," said a company spokesman.

The *American Zinc Institute* will hold its 40th Annual Meeting at The Chase-Park Plaza Hotels in St. Louis, Missouri April 14 and 15. The *Lead Industries Association* will meet on April 15 and 16 in the same place. A joint meeting of the two groups on April 15th will discuss plans for research programs in lead and zinc, and the world outlook for lead and zinc production and consumption.

The *American Zinc Lead & Smelting Company's* slab zinc electrolytic plant at Monsanto, Illinois was closed for a three-week period while repairs were made. During this period most of the employees took their vacations. The shutdown also enabled the company to reduce output by 4,000 tons of special high-grade slab zinc.

Bethlehem Steel Company is making good progress at its *Gracie* iron ore mine in Pennsylvania, and shipments are expected to start in the fall of this year. Crushing, screening, and stockpiling facilities are already in operation processing ore in preparation for later milling and concentrating. The mill is to be completed by late summer or early fall and then iron ore concentrates should be shipped. The first block of ore was being developed for caving at the end of 1957, and more than two miles of workings had been driven to the ore body from the shaft and within the ore. Production from the firm's limestone quarry at West Hanover is expected to start in 1960. Construction of the primary crusher is to be started this year.

The *Commodity Credit Corporation* negotiated barter contracts valued at $5,200,000 during the last quarter of 1957, as compared with $83,174,000 in the same quarter of 1956, and $272,600,000 for the full fiscal year 1957. These barter contracts provide for the exchange on an equivalent value basis of CCC-owned agricultural commodities for strategic materials. CCC will continue to barter its agricultural commodities for both strategic and non-strategic materials required by other Government agencies. Among the strategic materials for which CCC will currently consider barter proposals are: antimony; asbestos (amosite); bauxite (Jamaica, Surinam, refractory); beryl; chromite (refractory); copper; fluorspar (metallurgical); lead; manganese (battery-synthetic dioxide, chemical type A, and metallurgical); mica (muscovite block, film, and splittings; phlogopite splittings); silicon carbide (crude); and zinc.

North American Coal Corporation and *Strategic Materials Corporation* have formed a joint company called *Strategic North American Corporation* to develop and exploit a new process for recovery of high-grade alumina from low-grade coal mine wastes. The new firm is empowered to build and operate plants for production of alumina, basic aluminum raw material, and aluminum sulfate. The first plant is planned for the Ohio Valley where North American has extensive coal reserves, including the *Powhatan Mines*. These are located about 20 miles south of Wheeling, West Virginia, not far from where a new aluminum reduction facility is under construction. Before a commercial plant is erected, however, additional research and pilot plant work will be carried out at Strategic's

Vermont's Copper Mine Closes After 165 Years

The oldest copper mine in the United States, the Elizabeth mine of Appalachian Sulphides, Inc. at South Strafford, Vermont, has closed down after 165 years of on-and-off operation. Depletion of the ore body was the reason. In the photograph above, taken by John Titchen, miners are seen leaving the shaft for the last time. An extensive exploration program was undertaken in the general area of the mine and at the Milan copper-zinc prospect about 40 miles away, but apparently nothing substantial was found. Early last year, mill tonnage was cut from 22,000 tons monthly to 15,000 tons monthly, which resulted in raising the grade. This step was brought about by the lower price of copper. Appalachian has other properties in Virginia and North Carolina. Most of the Elizabeth's equipment will go to the Ore Knob copper mine in Ashe County, North Carolina. Appalachian is a wholly owned subsidiary of Nipissing Mines Company Ltd. of Toronto, Canada.

laboratories at Niagara Falls, New York. The basic process is known as the Strategic-Udy and utilizes an acid-leaching technique. Unlike the Bayer process, this one can use domestic raw materials high in iron and silica.

The *United States Tariff Commission* has submitted its report to the President on investigation No. 120 concerning tungsten ores and concentrates. The Commission concluded that, "owing to the highly abnormal and extraordinary developments which have affected the tungsten industries of all free world countries since 1950, it is impossible at this time to obtain information on either foreign or domestic production costs that would be representative of normal operations as required by the statute." Accordingly, the Commission has discontinued and dismissed the investigation. Copies of the Commission's report, which includes pertinent factual material bearing on developments in the domestic and foreign tungsten industries, are available upon request as long as the limited supply lasts. Address requests to the United States Tariff Commission, 8th and E Streets, N. W., Washington 25, D. C.

The *Pittsburgh-Pacific Company* of Hibbing, Minnesota has made a successful bid for the *Ramapa Mountain Iron Mines* at Ringwood, New Jersey. Bids were received by the *General Services Administration* (GSA) in New York. The mine has furnished material for American armies since the Revolution, but has never been a successful peacetime venture. The 232-acre site with its two known ore deposits was taken over by the GSA in 1955. Officials at the Pittsburgh-Pacific Company in Hibbing said the company has formulated no plans as yet for the Ramapo mines.

St. Joseph Lead Company has cut its operations at its *Balmat* and *Edwards*, zinc mines in New York to a four-day week. This reduces output of zinc concentrates at these properties by about 2,000 tons a month. The mines normally produce about 10,000 tons of concentrate each month.

Cowan and Company, well known shaft-sinking and development contractor in the southeast, has completed development work at *New Jersey Zinc Company's Treadway* mine. The mine has been turned over to New Jersey Zinc which plans to maintain a crew of only six men until zinc prices improve. Cowan and Company's work at Treadway included sinking two shafts through the ore zone, one incline into the ore zone for equipment and supplies, and several thousand feet of drifting.

U. S. Industrial Chemicals Company Division of *National Distillers & Chemical Corporation* is completing a pilot plant which will produce tantalum and columbium metals. Capacity will be one ton per month of combined metals, on a one-shift basis; three tons a month on a round-the-clock basis. The plant is located in Cincinnati, Ohio, where the U.S.I. Research Laboratories are located. Part of the same facilities that were used for pilot work on zirconium and titanium will be used in the new unit.

The *Dow Chemical Company* has developed a new process for recovering gallium one of the less common elements. The method consists of treating subdivided ore containing the metallic element with a current of hydrogen chloride or hydrogen bromide under substantially anhydrous conditions at a temperature ranging from 700° to 950° C. The current is utilized in an amount sufficient to volatilize gallium as the trihalide and condensing and recovering it as the pure material. The company says it believes the new process will make possible the extraction of substantial quantities of gallium from ores, particularly bauxite.

Hooker Electrochemical Company and *Foote Mineral Company* have formed a new firm, *HEF Inc.*, to manufacture compounds for solid rocket and missile fuels. The two firms undertook a joint study of components of high energy fuels last fall. HEF will specialize in work with ammonium perchlorate and other perchlorates. Foote has already done some research in certain areas of the solid propellant field and Hooker is a manufacturer of sodium perchlorate and potassium perchlorate.

A Circuit Court in Tallahassee, Florida confirmed *Coastal Petroleum Company's* claim of exclusive rights to all metallic minerals on lands it leases from the state of Florida for oil exploration. The state had contended the firm was entitled only to minerals which could be expected to be withdrawn by normal drilling methods. The ruling means that Coastal can claim rutile, ilmenite, monozite, zircon, and titanium on the leases, as well as oil, gas, sulphur, and potash. No mineral discoveries have been reported to the state since its lease in 1947. The state will appeal the decision.

Chesapeake and Colorado Corporation, *Nuclear Magnetic Mining Inc.*, *Western Oil & Gas Company*, and *Silver Sage Oil and Mineral Company* have been merged into *Jacob's Chair Mining Corporation*. The surviving firm's name will be changed to Chesapeake and Colorado Corporation. The new group plans to initiate a titanium operation in Florida where the merged company is said to have several million tons of heavy sands containing ilmenite, rutile, monazite and zircon under lease. Feldspar and mica are already being mined by the firm in North Carolina.

Inland Steel Company is making steady progress with the sinking of its new production shaft at the *Armour No. 2* iron ore property in Crosby, Minnesota. This shaft will eventually be Inland's main producer since the lease on the No. 1 shaft expires on June 1, 1959. Construction of surface buildings is continuing simultaneously with the shaft sinking. The headframe was completed last year.

Cleveland-Cliffs Iron Company has announced that there will be no price increase in iron ore in 1958. In the 1957 season, the company absorbed the increases in both rail and lake freights, as well as wage and salary increases. The 5 percent increase in Upper Lake rail freight this year, and the wage increases to be effective July 1 will also be absorbed.

M. A. Hanna Company continues to develop design of the proposed *Pierce Group* concentrator near Hibbing, Minnesota. The plant is scheduled for start of construction of mid-1958 with operation scheduled for 1959. Current design includes washing, heavy media, HMS cyclones, and spirals sections for treatment of 800 gross tons per hour of crude ore.

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American Chrome To Build Montana Pilot Plant

The American Chrome Company has started construction of a high carbon ferrochrome pilot plant at Nye, Montana. Production is scheduled to start in October at a rate of five tons per day. This will be increased later to 15 tons daily, with all output being offered to the steel industry.

The pilot plant will consist initially of a mix building and an electric furnace plant. Chromite concentrate from the company's mine and mill at Nye will be delivered and stored in the mix building. After mixing with the proper ingredients, the chromite concentrate will be reduced to ferrochrome in the electric furnace plant. The latter contains a 3,000-kva electric furnace, and numerous auxiliary equipment.

Exploration Boundaries Set for Coeur d'Alene

Deep exploration and development of properties immediately west of the famed Sunshine silver mine in Idaho's Panhandle will be stepped up as a result of agreements settling complex ore ownership problems raised by extralateral rights.

The major agreement was between the Bunker Hill Company and Sunshine Mining Company, Sunshine Consolidated, Inc., and Big Creek Apex Mining Company. It established a north-south plane near the west end of Big Creek Apex ground and an east-west inclined plane in the northerly part of Sunshine Consolidated ground running westerly from the vertical plane. Bunker Hill gets all ore west and north of the planes; the other three firms all ore east and south of the planes.

Sunshine now is free to extend its westerly deep workings on the Silver Syndicate vein in ground of Big Creek Apex, which is controlled by Sunshine Consolidated. Sunshine has operating, profit-sharing agreements with both firms. Bunker Hill now can explore its Crescent mine Alhambra fault-vein under Sunshine Consolidated.

A second agreement between Bunker Hill and Aberdeen-Idaho Mining Company settles both claim ownership and extralateral rights disputes, provides for deep development of Aberdeen ground from Crescent workings and establishes profit-sharing areas.

A rich silver-copper vein found on the 3,000-foot level of the *Galena* mine, Shoshone County, Idaho, has been followed downward 700 feet to the 3,700 level where ore continues to be of average width and grade. The mine is leased to *American Smelting and Refining Company. Day Mines, Inc.* Wallace has a 25 percent interest in the lease. The mine is owned by *Vulcan Silver-Lead Corporation* which is being merged into the parent *Callahan Zinc Lead Company.*

Day Mines, Inc. has completed a vertical winze from the 1,600 level of its *Hercules* mine near Burke, Shoshone County, Idaho, to a new 1,900 level. The work was done with assistance from the Defense Minerals Exploration Administration. Recent work at the firm's *Dayrock* mine has added several hundred feet to the length of the new Bonanza lead-silver ore shoot.

A new Idaho County mining firm has been formed. It is *Elk City Placer Mines, Inc.*, with $100,000 capitalization. Incorporators are C. G. Cafarelli of Salt Lake City, and J. A. Ziebarth Jr., Verda S. Rossiter, Eugene E. Holcombe and Kenneth W. Law, all Pocatello, Idaho.

The new 2,450-foot level of the *Lucky Friday* mine near Mullan, Shoshone County, Idaho, has yielded rich silver-lead ore for more than 1,200 feet—a new record for the mine. The ore shoot has lengthened steadily as depth has been attained. At last report, cross-cutting to the structure was underway to open a new 2,600-foot level. Charles E. Horning of Wallace is president.

Four residents of Grangeville, Idaho, James W. and Margaret Hart, William J. Dee, and Stephen F. Roberts, have organized *Margaret Mining Company*, with capitalization of $50,000.

Sidney Mining Company, last remaining active producer in the Pine Creek zinc-lead district of the Coeur d'Alene Mining Region, Shoshone County, Idaho, recently laid off two-thirds of its work force. The company blamed operating losses brought about by low metal prices resulting from "excessive dumping of foreign metals on the domestic market." E. K. Barnes, Spokane banker and president of the Northwest Mining Association, has been named vice president to succeed the late William A. Beaudry, Seattle.

Golconda Lead Mines' custom flotation mill east of Wallace, Shoshone County, Idaho, has been operating at capacity of 225 tons a day for more than a year. Most of the ore handled continues to come from the Lucky Friday mine, although a substantial tonnage has been received from ASARCO's *Morning* mine since the Morning mill burned to the ground a year ago. The Golconda mine was closed in the first quarter of 1957 because of low zinc-lead prices and all equipment removed to avoid underground maintenance costs. J. A. Featherstone of Wallace is president.

Quartz mining leases on 120 acres in Clearwater County and 160 acres in Idaho County have been granted by the Idaho state land board to Everett Hougland of Republic, Washington, mining engineer, and to James Marsh of Grangeville.

Wallace, Idaho, heart of the great Coeur d'Alene mining region, will observe its 75th anniversary June 11 through 15 with a celebration billed as the biggest in its colorful history. The celebration will be held in conjunction with the 150th anniversary of *Wallace Brothers Silversmiths* of Wallingford, Connecticut. That firm has designated the Idaho community as the "Silver Capital of the World" and is giving the event national publicity. A plaque will be unveiled honoring the city's founder, W. H. Wallace. There will be a parade, barbecue, "Sourdough" breakfast, Slippery Gulch attractions, mining and logging contests, "Gay Nineties" and whisker-growing contests, bowling and golf tourneys, boxing, dancing, mine tours, and the 17th Lead Creek Derby. J. C. Kieffer, manager of the *American Smelting and Refining Company's* Northwest Mining Department, is general chairman of a committee arranging for attendance and entertainment of visiting dignitaries.

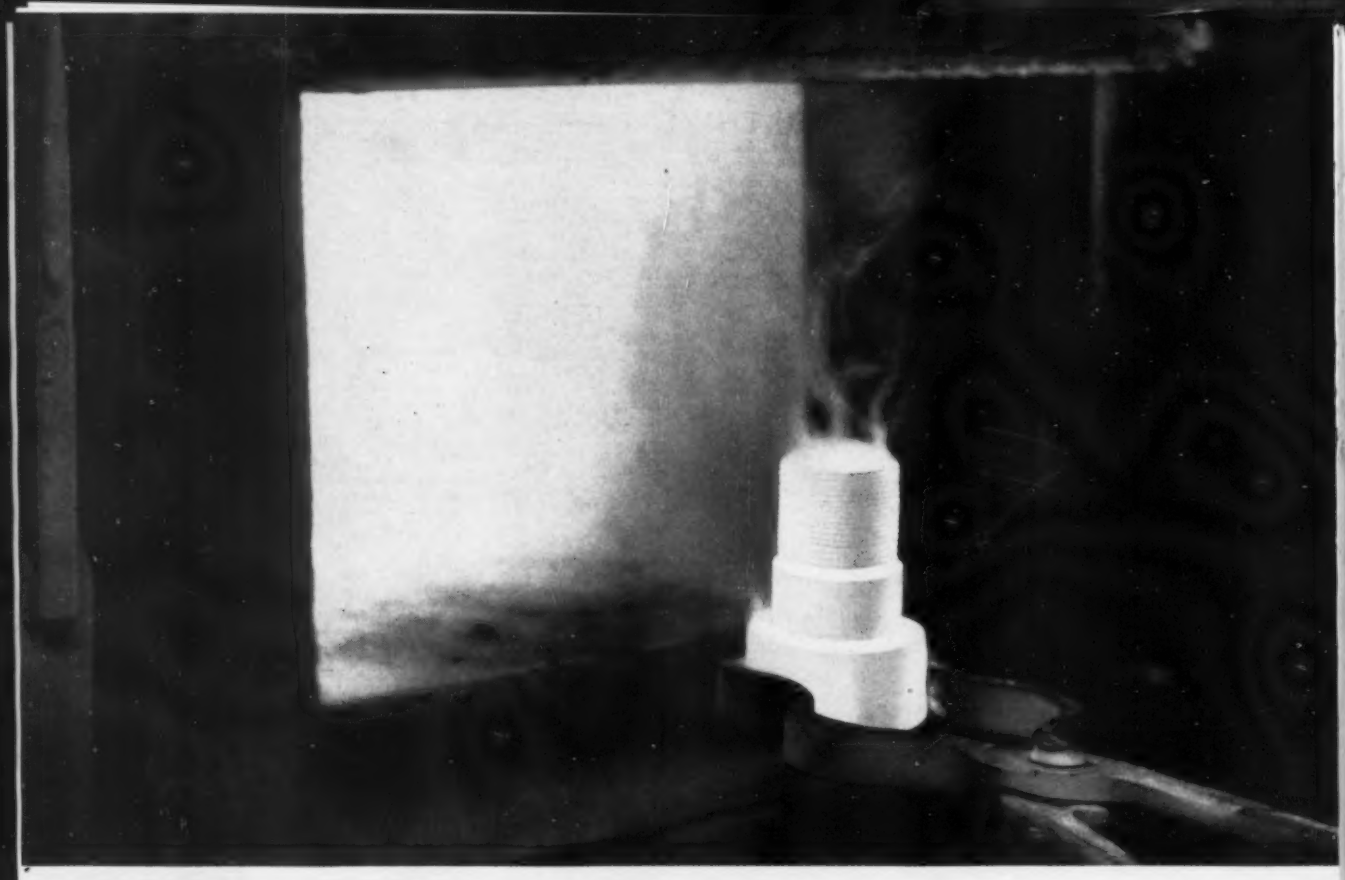
Among recent incorporations in the state are the following: *Black Sands Mining Corporation* of Rexburg, Idaho, incorporated by Reed L. Peterson and Ray Moedl of Rexburg, Sam R. Moon and Charles H. Harrington of Ashton, and Thomas Deppe of Idaho Falls; *Mc D. Mining Company* of Boise, by A. B. Jonasson, C. W. McDowell, and W. R. McDowell, all of Boise; *Lone Pine Mining Company Inc.* of Kamiah, by Donald Rowe and Gus Darland of Nampa, and Robert L. Armsbay of Kamiah; *Latah County Clay Company* of Boise, by John Johanson of Kendrick, Amelia Knott of Portland, and Carolyn Williamson of Spokane.

The recently organized *Old Continental Mining Company* hopes to make a steady producer this year out of the old *Idaho Continental* lead-silver mine 30 miles west of Porthill, Boundary County, Idaho, just south of the Canadian border. The firm is a reorganization of *Jireh Mining Company*, formed in 1952 as successor to Idaho Continental Mining Company. Organizers installed some $60,000 worth of equipment, including a new ore crushing plant, during 1957 and shipped a small amount of lead-silver concentrate to the Bunker Hill smelter at Kellogg. Discovered in 1884, the mine has been operated intermittently and has about three miles of underground workings. Incorporators of Old Continental Mining Company were Philip and Eleanor Priano of Couer d'Alene and Frank E. Speer of Spokane.

A new lower drift is planned on a uranium-bearing phyllite structure at the *Lucky Joe* property in Ravalli County, Montana. The new drift will be about 200 feet below previous exploration work which was some 50 feet beneath the surface. The development is being carried on jointly by *National Uranium Corporation* and *Hypotheek Mining and Milling Company* of Wallace, Idaho.

Montana Iron Mining Company hopes to be in production by the end of May at its iron ore mine 18 miles from Stanford, Montana. A plant is being erected, and Norman Nelson of Billings will be plant superintendent. Dewey Whittaker is president. Working in the same general area is the *Young Montana Mining Company* headed by Ernest Young of Hibbing, Minnesota.

The *Montana School of Mines Research and Development Foundation* has announced that a new research center will be built at the Montana School of Mines in Butte. The center will be concerned primarily with research in the fields of geological, mining, mineral dressing, metallurgical, and petroleum engineering "with a view toward aiding industry by finding new techniques or more fully exploring familiar paths in production."



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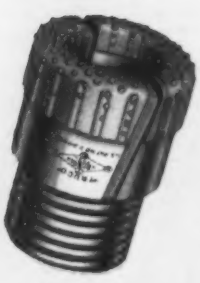

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Montana's school fund has received its first income from manganese mining operations of state school land. According to Commissioner of Land Lou Bretzke, *South Dakota Uranium and Mining Company* of Hot Springs, South Dakota, paid $56.29 royalty on its first production. The firm is operating in Beaverhead County, near Glen. The company's president, C. R. Boyle, estimates they will mine up to 100 tons daily at maximum production, thus bringing state royalties to about $50 daily.

The *Jardine Mining Company* of Park County, Montana has filed a petition of voluntary bankruptcy in the United States District Court in Montana. The firm produced gold from the *Jardine* mine near Yellowstone Park for a period of 21 years. However, it has been inactive since 1948.

OREGON

The *Solar X Corporation* is planning construction of a half-mile access road to its recently located uranium deposits in the Steen Mountains of Harney County, Oregon. The company has 200 acres in its Pine Creek properties and plans to conduct additional exploration work at depth to determine the extent of the deposits.

New Delhi Mines Ltd. of Toronto, Canada has completed initial development of a nickel deposit in Josephine County, Oregon. Pitting operations to date are reported to have indicated at least 8,000,000 tons of 1.24 percent ore.

WASHINGTON

A barite deposit on Queen of Sheba Mountain north of Colville, Stevens County, Washington, will be developed by *Sunshine Mining Company* under a contract with *North Star Uranium, Inc.*, holder of the ground. Tonnage is undetermined but the grade of exposed surface lenses varies from 67 to 90 percent barium sulphate and metallurgical tests indicate a 97 percent chemical grade can be produced. The operation will aim at a developing market in the new Alaskan oil fields.

North Star Uranium, Inc. is exploring interesting showings of uranium mineralization in a strong fault zone in granite on the Spokane Indian Reservation, Stevens County, Washington. Percussion drilling will follow gridding. John F. Campbell, Spokane, is president, and Robert J. Hundhausen, company mining engineer.

Northwest Refining and Chemical Company at last report again was in the market for zinc concentrates, but its Spokane Valley plant, which recently resumed operations, is using the concentrates only in the manufacture of chemical fertilizer with a high zinc content. The plant was built principally to make zinc oxide. New fertilizer mixing and pelletizing equipment has been installed. William Burkhardt is chemical engineer in charge of production. William Helander, Spokane, is board chairman.

American Zinc, Lead and Smelting Company has been maintaining production at about 800 tons daily at its *Grandview* zinc-lead mine in the Metaline District, Pend Oreille County, Washington. Mining operations were on a five-day week, at last report. Seventy men were on the payroll.

Spokane National Mines is testing uranium properties of *Dahl Uranium Mine, Inc.* and of *Big Smoke Uranium, Inc.*, which it took over late in 1957 under merger agreements. In the first hole drilled on Dahl's section 13 in the Spokane Indian Reservation, adjoining the *Midnite* mine, mineralization was found from the 107-foot point to a depth of 190 feet. Reprobing of holes in Big Smoke Section 11 on the reservation near the Spokane River indicated 100,000 tons of ore reserves. Nine shallow holes on Dahl ground in the Mount Spokane district, northern Spokane County, disclosed a small body of high-grade autunite. George Allison of Casper, Wyoming is company president and Clyde Tedrow is engineer.

The *Aluminum Company of America* has made new cuts in its smelting operations at Wenatchee, Washington and Vancouver, British Columbia. Alcoa has been operating at 30 percent below full production capacity at its Northwest smelters since September 1. The new cut will reduce primary aluminum output about 45 percent below capacity. Existing high inventories and slowdown in demand are cited as the reasons for the production reduction.

The *Bear Creek* manganese property on Washington's Olympic Peninsula is being developed by *New Wellington Mines, Ltd.*, successor to *Wellington Mines, Ltd.*, British Columbia silver-lead producer. The firm recovered a small tonnage of high-grade in driving a 350-foot tunnel last season and optioned ground having considerable milling-grade ore in sight. It is seeking to interest an American firm in joint construction of a mill at Port Angeles. M. E. Oldring of Victoria, British Columbia is secretary.

A $16,000 drilling program will be undertaken this summer at the *Scandia* lead-zinc prospect in northern Stevens County, Washington, by *Grandview Mines* of Spokane. The Defense Minerals Exploration Administration will participate 50 percent. The firm also plans to prospect the *Just Time* group of claims near the Canadian boundary, and has optioned an old silver-lead property in Ferry County. In 1957 the firm sold the *Grandview* zinc-lead mine in Pend Oreille County's Metaline district to *American Zinc, Lead and Smelting Company*, long-time operator of the mine. Karl W. Jasper, Spokane, is Grandview president.

Clayloon Uranium Company has started sinking a shaft in the Mount Spokane District of Washington on ground which it is developing under a profit-sharing agreement with *Daybreak Uranium, Inc.*, holder of the lease. The shaft is going down at an angle of about 28 degrees on a vein of autunite which was mined to a depth of 70 feet. Frank Wilson is mine foreman and Byrl T. Goodwin, Spokane, company president.

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Cerro de Pasco Develops 4,000,000 Tons Cu Ore

Cerro de Pasco Corporation has now developed 4,000,000 tons of 2.5 to 3.0 percent copper at its Antamina property in northern Peru. In fact, the firm's geologists are still uncertain whether a big low-grade mine or a small high-grade mine can be developed. On the high grade theory, there are 1,000,000 assured tons of 4.0 percent copper. For a low-grade mine, there are 150,000,000 tons of 1.5 percent copper, 1.5 percent zinc, with some molybdenum. Underground mining probably would be necessary for a high-grade operation.

Cerro has been developing the property since 1951 and now knows the deposit is a structurally complex contact metamorphic (porphyry type) deposit between limestone and monazite. Further prospecting will be by churn drilling to obtain better samples in the ore zone.

This was the highlight of a talk by Robert Koenig, Cerro's president at a recent AIME meeting in San Francisco, California. Mr. Koenig also said that a solution appears near for treating the large tonnages of oxidized ore already developed at the company's established mines; in fact, the possibility of mining by a major open pit is very good. Cerro is also considering the driving of a long, low-level, twin-drainage tunnel. Projected length is 33,000 feet. One heading is for hot water to drain through and the other to pump cold air into the mine.

Mr. Koenig reported that stripping at Toqepalla was now at the rate of 1.5 metric tons per second and, in the first 18 months after the first dipper full of stripping on November 5, 1956, a total of 50,000,000 tons would be stripped.

Dr. Donald McLaughlin, one of Cerro's directors, said that there was nothing wrong wth Cerro that a few cents higher metal prices wouldn't solve. Mr. Koenig expressed the opinion that 65 cents combined copper, lead, and zinc prices, in any combinations, would be a very favorable price. In conclusion he said that Cerro, together with many other mines, now needed a "greater production of equilibrium."

Anglo-American Closes Bancroft To Cut Output

The Anglo-American group of mines (Rhokana Corporation Ltd., Nchanga Consolidated Copper Mines Ltd., and Bancroft Mines Ltd.) in Northern Rhodesia's Copperbelt has joined the other major producers in making a 10 percent cut in copper output. Accordingly, Bancroft Mines, Ltd. ceased production on April 1st with the mine placed on a care and maintenance basis for a year. However, development will continue in the rich No. 1 shaft area. To compensate Bancroft for shutting down, Rhokana Corporation and Nchanga have agreed to finance Bancroft's loan interest and provide funds for further development of No. 1 shaft.

Anglo-American's scheduled cut will be equivalent to 27,000 long tons per year. As Bancroft's planned capacity is 40,000 tons, the excess of 13,000 is to be produced by Rhokana and Nchanga.

Bancroft, with a capitalization of over £16,000,000, went into production at the beginning of last year, well ahead of the original schedule, but immediately ran into serious mining difficulties as a result of bad ground with excessive mud and water. Minor treatment problems were also experienced in concentrating the ore which is a mixed oxide-sulphide and actual production was well below rated capacity. In this connection it is to be noted that the cut in production is based on the assumption that Bancroft was producing at full capacity—the effective cut will be appreciably below the figure of 27,000 tons.

All Copperbelt mines have been gravely concerned at the persistent fall in copper prices. While no official production costs have been released, the following figures are believed to be fairly accurate.

Company	*£ Per Long Ton Delivered*	*Cents Per Pound Delivered*
Rhokana Corporation	£ 140-£ 145	17.5-18.2¢
Roan Antelope Copper Mines Ltd.	150-156	18.8-19.5
Bancroft Mines Ltd.	185	23.2
Nchanga Consolidated	110	13.8
Mufulira Copper Mines Ltd.	145	18.2
Chibuluma Mines Ltd.	120	15.1

These figures reveal the extreme difficult position of Bancroft and why production has been suspended. With copper selling for about £ 165 in early March, the small profit margin at Roan Antelope is apparent. Roan Antelope shares are extensively held (32.65 percent) by American Metal Climax, Inc.

New Firm To Develop Canadian Iron Discovery

A new firm, Great Whale Iron Mines, has launched a $400,000 drilling program on a magnetite iron discovery some 700 miles north of Montreal, Canada. The firm has a concession covering 152.8 square miles on the east side of Hudson Bay.

Financing the operation on three firms: Belcher Mining Corporation, Wright-Hargreaves Mines, and Malartic Gold Fields. All are associated in the Little Long Lac group of companies. They teamed up last July to make the discovery and obtained a concession from the Quebec government in December.

Some 30,000 to 40,000 feet of drilling is planned through the season. Airborne magnetic and gravity surveys have been carried out by Lundberg Explorations Ltd. One ore body, reportedly 1,900 feet wide and over 15,000 feet long, has been followed on the ground. Samples have shown a grade of 40 to 43 percent iron, and tests indicate the ore could yield a concentrate of 65 percent iron on coarse grinding and 70 percent after finer grinding.

Fluorspar Output Resumes At Newfoundland Project

Newfoundland Fluorspar, Ltd., a subsidiary of Aluminium Company of Canada, has resumed operations at its mine and mill at St. Lawrence, Newfoundland after completing a $400,000 plant changeover program. Shipments this year are expected to total about 60,000 tons, depending upon level of aluminum production in 1958.

The main changes to the mine and surface plant included: excavation of ore passes underground; installation of an underground primary crusher and belt conveyor to transport the ore from the crusher to the skip loading pockets; installation of new skips and skip loading equipment; erection of a new hoist house and installation of a new hoist; erection of a new 500-ton shaft bin; and major changes to the surface crusher.

No ore was hoisted during the period of the shutdown, but development work continued on the new 550-foot level, as well as the preparation of new stopes and some pillar removal.

Old Spanish Iron Mines Yield 50,000 Tons of Ore

Approximately 50,000 tons of iron ore have been exported from the old iron mines at Calasparra and Cehegrin, Spain, now operated by Don Jose Montez. Development of the properties, which had been idle for more than 25 years, was begun last year following a program set up by E. H. Gruenert, consulting engineer. Dr. Denkelwitz, of the German firm, DEMAG, also participated in investigations. Most of the exported ore, which assays approximately 60 percent iron with one percent sulphur, is shipped to Kloeckner, Germany.

YUGOSLAVIA—Exploration of the *Majdanpek* copper deposits, started in 1949, has been completed and stripping of 5,000,000 cubic meters of overburden is underway. Ore reserves are now estimated at 200,000,000 metric tons of ore containing approximately 1,500,000 tons of copper. Mining, by open-pit method, is expected to begin within three to four years. A 21,000-ton-per-day flotation plant is to be constructed to supply concentrate for electrolytic refining at a rate of 25,000 tons annually.

FINLAND—Three iron ore deposits, reported to contain about 10,000,000 metric tons of ore, have been discovered near Kolari in northern Finland. The ore assays 30 to 40 percent iron and can be worked by open-pit method. Exploration has been underway in the area for the past two years, and it is believed that further investigation may prove the deposits to be even larger than the preliminary figure.

EIRE—Dewatering of *Emerald Isles Mining Company*, Ltd.'s *Mountain* mine has reached the 744-foot level, approximately the halfway mark of the projected 1,800-foot development. With the opening of each level, tests have indicated that the grade of copper improves with depth. A 100-pound ore sample shipped to the Colorado School of Mines Research Foundation for metallurgical tests showed a copper content of 3.29 percent, from which a 33 percent concentrate could be produced with 96.2 percent recovery, using a simple flotation process. The company now plans to completely dewater

and rehabilitate the main shaft before beginning further exploration of the mine.

ITALY—Quicksilver exports in 1957 dropped to 992.4 metric tons, as compared to 2,585.6 metric tons in 1956.

RUSSIA—Production of crude steel in 1957 exceeded the 51,000,000-ton goal set by the national economic plant for the year, according to recent reports. This indicates a 50 percent expansion in the past five years, since 34,500,000 tons of crude steel were produced in 1952. Plans for 1958 production call for 53,600,000 tons of steel, 39,100,000 metric tons of pig iron, and 41,700,000 tons of rolled steel. Seven blast furnaces are to be built and put into operation in 1958, and an increase in steel rolling facilities is also planned.

SPAIN—*Cia Siderurgica de Ponferrada* is reportedly planning to construct a blast furnace near Ponferrada, Leon Province, with a capacity of 150,000 tons of iron annually. The installation will consist of a blast furnace and Thomas converter.

FRANCE—*Societe Miniere et Metallurgique de Penarroya* plans to continue its lead-zinc development program despite the unfavorable world market for these metals, according to company officials. Penarroya invests approximately 400,000,000 francs a year in expanding production capacity and locating new ore reserves. Its reserves are now estimated at nearly 48,000,000 tons of ore. Lead and zinc production from the *Malines* mine has been doubled and development of deposits at Saint Sebastien d'Agrefeuille, with proven reserves of 3,000,000 tons of lead ores, has begun. In Italy the company has enlarged its interests in *Petrusbla;* in Sardinia work is in progress at Arenas, where reserves of lead ore are set at 2,000,000 to 2,500,000 tons.

ITALY—Production of iron and steel in 1957 showed an increase of 15 percent over that of 1956. Total steel output for the year was approximately 6,800,000 tons, compared with 5,900,000 tons in 1956. Pig iron production in 1957 was 2,000,000 tons, and in 1956 1,900,000 tons were produced. Production in 1958 is expected to decrease slightly.

PORTUGAL—Negotiations have been completed for the construction of an iron and steel works near Lisbon. The project will be a joint venture involving *DEMAG;* two German firms, *Rheinstahl Industrie-Planung GmbH* and *Carl Still;* and the Belgian *Syndicat Belge d'Entreprise a l'Etranger* (SYBETRA). The new iron and steel works will have initial capacity of 250,000 tons of steel ingots annually. Proposals have been made for wharfage space for ore, coke, and coal; a coking plant; blast furnaces with annual capacity of 210,000 tons; a sinter plant (700-800 tons per day); a steel plant with one 35-ton electric arc furnace and a 30-ton oxygen-blown converter; and a rolling mill. The rolling mill will facilitate annual output of 150,000 tons of light-section stock and 50,000 tons of medium-section stock. Ore needed for the works will be supplied from the Orada, Cercal, and the Moncorvo deposits.

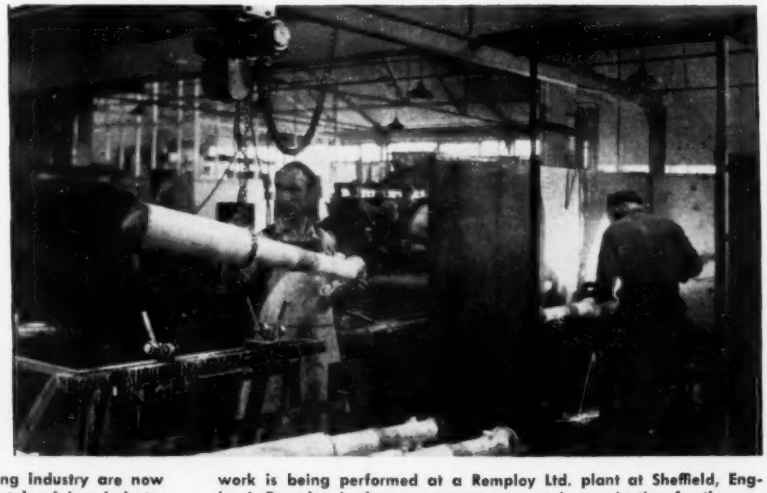
EIRE—A team of geologists from the United Kingdom has undertaken a survey of lead and zinc deposits in County Armagh, at the request of the County Committee for Agriculture and the Northern Ireland Ministry of Commerce.

POLAND—A three-year trade agreement, beginning in 1958, has been signed by Poland and Yugoslavia, involving an estimated $188,000,000 worth of goods. Under the terms of the agreement, the majority of Poland's exports will consist of machinery and industrial equipment, coal, coke, metallurgical and chemical products. In exchange, Yugoslavia will supply mostly raw materials, including zinc and pyrite concentrates, chromium ore, lead, magnesite, and asbestos.

RUSSIA—Diamond fields as rich as those in South Africa have been found in Yakutsk, northern Soviet Union, according to recent Soviet reports. The diamond fields are said to cover a 1,500 kilometer area. New goldfields have also been reported in the area between the Podkamenna, Tunguska, and Amgara Rivers.

CYPRUS—The *Cyprus Mines Corporation* of Los Angeles, California, which has a number of sulphur mines on the Island of Cyprus, recently financed a study of present and potential world sulphur reserves and production and estimates of future demand for pyritic sulphur. According to this study, the use of pyritic sulphur in Europe is increasing in spite of strong competition from United States and Mexican producers of sulphur by the Frasch method. By 1965 West Germany will probably double its pyrite ore imports, and Spain, Portugal, and the Scandinavian countries will continue to use a large amount of pyritic sulphur. In the United Kingdom, however, in order to maintain present consumption rate of pyritic sulphur, it will be necessary to lower prices to compete with the cost of native sulphur. Similar price cuts will probably be necessary in The Netherlands and Belgium, also.

Metal Mines Use More Hydraulic Props as Semi-Permanent Supports



The Dowty hydraulic pit props of the coal mining industry are now finding more and more application in the metal mining industry where they are used as semi-permanent supports at the stope edge. They are in extensive use in the South African gold mines, notably Bloemfontein, Vlakfontein, and Blyvooruitzicht, where they have proven highly successful under extremely arduous blasting conditions. They are now being considered for use in silver and asbestos mining. Unlike timber supports, hydraulic props are not considered expendable; given reasonable care, they have a useful life for many years. Damaged props, instead of being written off, can usually be reconditioned to their original standard. Serviceable parts are salvaged and reassembled with new parts where necessary. This reconditioning work is being performed at a Remploy Ltd. plant at Sheffield, England. Remploy is the government-sponsored organization for the employment of disabled persons. Sir George Dowty, chairman of the Dowty group of companies, is also a director of Remploy and he has encouraged participation of his firms in this movement. Dowty Mining Equipment Ltd. is the second of his firms to become associated with Remploy. Many of the workers of the Sheffield plant were disabled in the mining industry. In the photograph above left, taken in the Sheffield plant, props are partly dismantled in the fixture before passing through the cleaning plant, visible in the background. At right, extensions are being welded to the rebuilt props.

ARGENTINA—*Mina La Casualidad* of Establecimiento Azufrero Salta has been successful in up-grading flotation concentrates from 85 percent to 99.8 percent sulphur. By a new method, low-grade ores formerly considered unprofitable, as well as sinter from autoclaves, are being treated by flotation, with subsequent refining of the concentrates in the same autoclaves formerly used for the treatment of high-grade ore only. Plans for a new flotation plant with a capacity of 1,000 tons per day are being considered. La Casualidad produced some 18,000 tons of refined sulphur in the year ended last October.

JAMAICA—*Reynolds Jamaica Mines Ltd.* has doubled production capacity. Improvements include a second aerial tramway; a lengthened pier to accommodate large vessels, such as the new "S.S. Richard"; roofed bauxite storage space increased from 25,000 to 145,000 tons; and an increase in ship loading capacity to 3,600 tons an hour. Reynolds placed two new large ships in service in 1957, transporting ore from the Caribbean ports to the United States. One of these is the "S.S. Richard", mentioned above, which is the largest self-unloading bauxite ship in the world. The other is the "S.S. Louise", also self-unloading.

CENTRAL AMERICA—*Bunker Hill Company* of San Francisco, California, a large lead-zinc producer in the Coeur d'Alenes of Idaho, has joined *W. R. Grace & Company* in an exploration program in Central America.

MEXICO—*Newmont Mining Corporation* and *Hanna Coal & Ore Corporation* have completed their experimental nickel smelting operations in Santa Rosalia, Lower California, Mexico. An old copper reverbatory furnace had been rebuilt for the experiment. Ore came from Hanna's low-grade lateritic nickel deposit at Riddle, Oregon. One possible application of the experiment is in smelting laterite ores in order to produce a matte refinable by the Sherritt Gordon ammonia pressure-leaching process.

BRAZIL—The *M. A. Hanna Company* is preparing to send to Minas Gerais state a United States management team fully equipped to explore the iron ore reserves of the *St. John d'el Rey Mining Company*. Detailed studies will also be made of transportation and dock facilities for shipment of iron ore. Hanna, through its subsidiary *Hanna Coal & Ore Company*, has acquired with Leo Model of New York a controlling interest in St. John. The property is estimated to contain about 2,000,000,000 tons of iron ore in reserve, in addition to its vast gold, bauxite, and manganese reserves.

ARGENTINA—*Sociedad Mixta Siderurgica Argentina* has signed contracts with several West German firms for the installation of four Siemens Martin furnaces at the *San Nicolas* steel plant. *Luftus Engineering Corporation* will do the design work. The San Nicolas project is being carried on in cooperation with the Export-Import Bank and is supposed to be in operation by the middle of 1960. The plant will start with smelting of imported ores, but utilization of *Sierra Grande* iron ore is being considered, too.

MEXICO—Several new operations are under way in the state of Jalisco. Jose Maria Rangel is developing the *Carmen* gold-silver-copper mine located at Union de Tula. Jesus Alfiro Perez is developing the *Providencia* manganese property at El Grullo. The ore contains over 43 percent Mn. Prospecting permits have been granted to Guadalupe Carmona and Cleofas Mata Cordoba for tin ore. Mr. Caroon Carmona is interested in the *El Capulin* mine at Ojuelos, while Mr. Cordoba will explore the *El Refugio* at Lagos de Moreno.

PERU—*Marcona Mining Corporation* is reported to be considering plans for erection of a $25,000,000 iron ore beneficiation plant at its mine near Port of San Juan. Pilot plant operations reportedly have already been satisfactory. Shipments from the property have been steadily mounting since 1953 when 947,529 long tons of ore were exported; in 1957, the amount shipped totaled 3,239,094 long tons. Continuing exploration has also greatly increased Marcona's reserves. Reserves are now estimated at more than 70,000,000 tons of 60 percent ore or better.

CHILE—Taking note of the government's recommendation that a 10 percent production cut be made by the United States copper firms in Chile, *Kennecott Copper Corporation's Braden Copper Company* plans to cut its European shipments by more than 10 percent this year. Since last year almost all of Braden's 180,000 tons of copper went to Europe, this can be expected to be reduced by at least 18,000 tons in 1958. *Andes Copper Mining Company* and *Chile Exploration Company*, *Anaconda Company* subsidiaries, have indicated they will also follow the government's recommendation.

BRAZIL—*Cia. Eletroquimica S.A.* is completing a new plant which will bring its annual aluminum output to 7,000 tons by August of this year. This company is controlled by *Cia. Aluminio do Brasil*, a subsidiary of *Aluminum Ltd.* Its plant is located at Saramenha, Ouro Preto, Minas Gerais state. In 1956, the firm produced 1,653 metric tons. *Cia Brasileira de Aluminio*, located at Aluminio station, state of Sao Paulo, produced 4,707 metric tons in 1956, and is steadily increasing its facilities so that anticipated rate in the near future is 20,000 tons. At present, Brazilian consumption is 19,000 tons annually. The bauxite for these plants is produced in Pocos de Calda, Caldas, Araxa, and Ouro Preto, state of Minas Gerais; Moji das Cruzes, state of Sao Paulo. In the Pocos de Caldas area, the reserves are estimated at 150,000,000 metric tons.

CUBA—*Cuban American Nickel Company*, *Freeport Sulphur Company's* Cuban subsidiary, has authorized *Girdler Construction Division* of *National Cylinder Gas Company* to engineer and equip an automatic plant which will produce 60 tons per day of liquid hydrogen sulfide for its ore concentrating facilities at Moa Bay. It is said to be the first large-scale hydrogen sulfide plant ever used in ore processing. The Girdler division has also been authorized to engineer a plant which will produce 1,500,000 cubic feet

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of hydrogen per day as a raw material for the hydrogen sulfide plant, and will provide storage facilities for hydrogen sulfide and for the liquid butane which will be raw material for the steam hydrocarbon process hydrogen plant. The $119,000,000 nickel-cobalt project is scheduled for operation by the middle of 1959.

CHILE—*Wells Overseas Ltd.* of Toronto is said to have a contract for development and mining of the *Algaaroba* iron ore deposits. The property is owned by a group headed by *William H. Muller & Company* of The Hague, The Netherlands. Financing for the project is said to come from a loan from the *American Overseas Finance Corporation* of New York. Wells Overseas handles the overseas business of *Wells Cargo Inc.* of Reno, Nevada.

BRAZIL—The province of Rio Grande do Norte is rapidly becoming a scheelite mining center. Numerous foreign companies are said to be interested in this promising area. One of the leaders in the development of scheelite production in the province has been *Wah Chang Corporation* of New York. Through its subsidiary, *Mineracao Wahchang S. A.*, it is operating a mine and mill.

MEXICO — *American Metal Climax Inc.*, through its subsidiary, *Cia. Minera de Penoles S.A.*, owns and operates lead and lead-zinc mines in Mexico. The current low prices for lead and zinc have now made these operations uneconomical, and the firm is stockpiling its zinc output instead of selling it on the market.

BECHUANALAND—A three-man delegation from Bechuanaland has been in London recently to negotiate a mineral concession in the Bamangwato Reserve with the *Rhodesian Selection Trust Ltd.* The discussions are of a preliminary nature because there would have to be more prospecting work conducted before any serious decisions could be made about the property.

UGANDA—*Kilembe Mines'* mill is currently handling about 1,600 tons of ore daily, with production of about 800 to 850 tons of copper per month. Present objective is to increase this to 900 tons per month, with 1,000 tons monthly by the end of the year. This latter rate is to be achieved by completion of a 500-ton-per-day oxide ore section. Because of the uncertain market conditions, the company has not proceeded with original plans for installing a cobalt recovery plant at the smelter.

UNION OF SOUTH AFRICA—*Consolidated African Mines Ltd.* has completed the merging of a number of small manganese producers in the Postmasburg area of the Northern Cape Province. At a cost of about £75,000, converted into shares, the firm has acquired mineral and mining rights over two properties; machinery, plant, and stock thereon; rights to a truck allocation for 1,000 tons a month under a royalty agreement with another company; and the total issued share capitals of five other companies. The centralization of control and management will affect certain economies—the rail truck allocation has been raised from 5,000 to 6,000 tons a month which will bring a reduction in transportation costs, and overhead has been reduced, especially in staff and labor. Contracts taken over include the supply of lower grade ores, of the manganiferous type, for which a regular market has been established at profitable prices in Europe and the Far East.

SOUTH WEST AFRICA — *Tsumeb Corporation Ltd.* has decided to cut ore output by approximately 20 percent from current mill capacity because of poor metal prices. In fiscal 1957, the company milled 638,481 tons averaging 5.03 percent copper, 14.18 percent lead, and 5.82 percent zinc. In that period the company also produced cadmium and silver. Assured ore reserves were estimated at 9,490,000 tons, averaging 5.38 percent copper, 14.17 percent lead, 4.50 percent zinc, and 0.017 percent germanium. Exploratory drilling at Tsumeb's *Asis* mining claim about 30 miles away from the main operation has disclosed two small ore bodies totaling about 1,000,000 tons, averaging 11 percent combined copper and lead. Exploration is continuing.

GHANA — Exceptional development values have been reported by *Ashanti Goldfields Corporation Ltd.* in crosscuts on lower levels of the mine. On the No. 36 level, values have ranged between 38.6 and 58.9 dwts. per ton over reef widths of 8.5 feet and 18.5 feet, respectively. In two other cross cuts on the same level, values exceeding 40 dwt. gold per ton over reef widths of more than 20 feet have also been exposed.

FEDERATION OF RHODESIA & NYASALAND — *Anglo-American Rhodesian Mineral Exploration Ltd.* is reported to be negotiating with owners of claims in the Wankie area in Southern Rhodesia where indications of uranium have been discovered. In the rest of the Rhodesias, the search for straight uranium has so far proved unsuccessful, and the United Kingdom Atomic Energy Authority's plans for establishing a uranium processing plant have been shelved.

UNION OF SOUTH AFRICA—*O'okiep Copper Company* has decided to hold its output at its *Namaqualand* mines to 83 percent of current capacity because of the slackening demand for copper. The company's expansion program which was started in 1955 has now been completed but the mine output will be held at 125,000 tons monthly, instead of increasing to the 150,000 tons now possible. O'okiep is one of the low-cost copper producers with cost per pound of blister copper last year estimated at 14.8¢. Still its net income for six months ended December 31, 1957, was reported as $1,577,731, compared with $7,033,833 in the same period of 1956, and $9,345,548 in the same period of 1955.

LIBERIA—The German *Huetten Union Steel Corporation* is reported to have been negotiating with the Liberian government for an iron ore concession. The company is already an important importer of Liberian iron ore. The deposits recently located in the Voinjama area are said to be the ones this firm is interested in acquiring. Another German firm, *Krupps*, also has been showing an interest in Liberian iron ore but no definite proposals have been announced.

NIGERIA—*Amalgamated Tin Mines of Nigeria Ltd.* and its subsidiaries produced 3,388 tons of tin concentrates and 478 tons of columbite concentrates in the period from April to December 1957. For the quarter ended December 1957, production of tin amounted to 1,165 tons and columbite concentrates totalled 179 tons.

UNION OF SOUTH AFRICA—Operations by *Western Holdings Ltd.* are being conducted with three main objectives in view: completion of the No. 3 twin-shaft system, which should be achieved by the middle of the year, and start of development in the upcast western section; expansion of the reduction plant's capacity from 125,000 to 150,000 tons a month from the end of the year, to handle ore from the western section; extension of development and mining operations west of the two existing shafts and between them, and advancing the two twin exploratory crosscuts further to the eastern boundary. Between the line of the two shafts and the major fault system, there are indications that a comparatively

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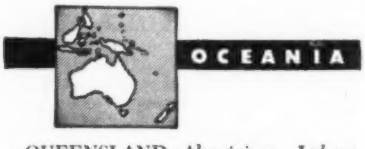
unbroken area of ore body extends down to the 5,000-foot elevation, which will be opened up from sub incline shafts to be sunk from points adjacent to the existing main shafts. Pumping capacity has been increased at the northern No. 1 shaft.

FEDERATION OF RHODESIA & NYASALAND—Ore reserves at the *Mangula* mine of *Messina (Transvaal Development Ltd.*, operated by *MTD (Mangula) Ltd.*, increased about 8,000,000 tons last year to 25,881,000 tons. Average grade is reported to have dropped from 1.6 percent copper per ton to 1.36 percent. The figures include only sulphide ore. Additional tonnages of oxide and mixed oxide-sulphide ore exist nearer the surface. Total development work completed during the fiscal year ended September 30, 1957 was 37,484 feet.

UNION OF SOUTH AFRICA—*Palabora Mining Company* has had eight drills at work outlining the low-grade copper mineralization indicated on its copper prospect in the northern Transvaal. If the work outlines sufficient ore, a large-scale open-pit operation may be possible. The firm is waiting for official authorization from the South African government on a lease for the property.



QUEENSLAND—*Aluminium Laboratories Ltd.*, subsidiary company of *Aluminium Corporation of Canada*, has discovered additional large bauxite areas on Cape York Peninsula. These are believed to be extensions of the great *Weipa* discovery. More work is necessary to determine the extent of the commercial bauxite. £200,000 has been spent on prospecting, with work centered south of Mapoon Mission (Port Musgrave) in the Wenlock-Ducie River area to the north, and in the Archer River area to the south of Weipa. No announcements have been made by the Canadian firm regarding development plans.

REPUBLIC OF THE PHILIPPINES—A third kiln is to be installed at *Palawan Quicksilver Mines'* furnacing plant on Palawan Island. Major machinery has already been shipped from the U.S. Two 80-ton Gould furnaces are already in operation. In December the plant treated 3,702 tons of cinnabar ore, recovering 19,518.7 pounds of mercury. This was lower tonnage milled because the plant lost 249 hours carrying out annual major overhauling on both kilns. A high moisture content of 13.52 percent in the ore treated (coming from 64 percent soil) also reduced milling efficiency.

NEW ZEALAND—The *New Zealand Mines Department* is now spending £12,000 on an access road to carry heavy equipment to the Buller district where a main seam of ore containing economic quantities of uranium appears to extend over a 600-square-mile area. The uranium minerals are reported to be the same as mined in Colorado, but different than those found in Australia. Negotiations between the *United Kingdom Atomic Energy Authority* and the holders of uranium mining rights are expected to be completed soon. According to latest reports, the U.K. Authority might share the

cost of advanced prospecting with the New Zealand government.

WESTERN AUSTRALIA—*Kalgoorlie Goldfields Petroleum N.L.* has taken an option over the old *Morgans* gold mine and will conduct exploratory diamond drilling under the supervision of the Mines Department. The following figures show earlier production: 1897-1912 575,148 tons yielded 294,758 ounces; 1913-1931 198,588 tons yielded 57,547 ounces; 1935-1938 5,842 tons yielded 1,937 ounces; 1938-1952 4,568 tons yielded 13,789 ounces. The mine has a main shaft 670 feet deep which is about 300 feet below the bottom of the main orebody. At the 500-foot level, an east crosscut intersected another lode which is considered to be unconnected with the west or main orebody.

REPUBLIC OF THE PHILIPPINES—*Philex Mining Corporation* expects to start milling next month at its copper property in the Baguio area. A contract signed with Japanese buyers calls for delivery of concentrates during the second half of 1958. The mill will have a capacity of 1,500 to 2,000 tons per 24 hours, and allowances have been made for possible future expansion. The crushing plant has a capacity of 4,000 tons per 24 hours, and this, too, can be expanded. Ore will come from the *Santa Tomas* open pit.

QUEENSLAND—*Mount Isa Mines* has completed a stage in its expansion program. A new hoist and new grinding mills for the copper flotation plant have been commissioned. Ultimate goal in mining is 13,000 tons per day; 6,000 tons a day have now been achieved. Cost of the complete program is estimated at £20,000,000 and will be financed largely from income.

REPUBLIC OF THE PHILIPPINES—*Liberty Chromite Mining Corporation* recently shipped metallurgical chromite ore to Holland. The company has only been in operation about a year, and had to complete a road and pier before shipments could be made. It is now operating chromite mines in Palawan, Samar, and Zambales. In addition, the firm is interested in several manganese deposits in Palawan. Geological study and diamond drilling have been going on, and production of high-grade manganese is expected to start by the middle of this year.

NEW SOUTH WALES—Four of the big silver-lead producers at Broken Hill have announced cutbacks in production by curtailing operations one day in every two-week period. The companies involved are *New Broken Hill Consolidated*, and *Zinc Corporation Pty.* (the two Broken Hill subsidiaries of *Consolidated Zinc*); *North Broken Hill*; and *Broken Hill South*. The first two firms have also suspended zinc concentrate shipments from Broken Hill. The bulk of these concentrates went to Great Britain. Last year, New Broken Hill milled 721,241 tons of ore, compared with 605,560 tons in the previous year. Zinc Corporation milled 767,069 tons compared with 712,180 tons in 1956.

HAWAII—The *United States Department of the Interior* is urging Congress to ratify, with some changes, an Act of the Hawaiian Legislature for promotion of development of the territory's bauxite deposits. Preliminary estimates indicate there may be over 600,000,000 tons of bauxite on the island, according to the Interior Department.

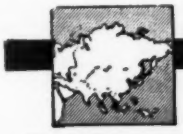
TASMANIA—*King Island Scheelite Ltd.'s* contract with the United States government for the sale of tungsten concentrates expires this month. After this, all concentrates must be sold on the open market, since the British contract expired last year. For the year ended October 31, 1957, the firm milled 264,588 tons of ore compared with 265,919 tons in the previous year. Overburden removed amounted to 1,159,936 tons, as compared with 1,555,035 in the previous year. The mine operated 360 days during the year, producing 1,437 tons of scheelite concentrates worth £1,881,839. In 1956, 1,521 tons of concentrate produced were worth £2,486,845. The mine is now working on a five-day week instead of seven. A four-weekly return this year has shown 82 tons of concrete recovered from 16,525 tons of ore.

REPUBLIC OF THE PHILIPPINES—*Atlas Consolidated Mining and Development Corporation* produced 38,121,923 pounds of copper from its *Toledo* mine on Cebu Island during 1957, as compared with 23,957,320 pounds in 1956. In 1957, 12,238 ounces of gold were produced, as compared with 7,116 ounces in the previous year. Also produced and shipped in 1957 were 14,067 metric tons of pyrite, as compared with 1,850 metric tons in 1956. Atlas' iron mines at *Mati* on Mindanao produced and shipped 162,286.5 dry metric tons during 1957. A prolonged drought in the area around Toledo prevented the mill from treating more than 312,494 tons of ore during January 1958. Production of copper concentrates totaled 5,758.88 dry tons containing an estimated 3,264,633 pounds of copper and 840.8 ounces of gold.

REPUBLIC OF THE PHILIPPINES—*Manila Mining Cororation* is developing two properties in Masbate and Agusan. The president, Charles A. Mitke, reports that enough good copper ore has been blocked out ready for mining.

NEW SOUTH WALES—*Mines Exploration Pty. Ltd.*, a subsidiary of *Broken Hill South Ltd.*, has closed its *Conrad* lead-zinc mine at Howell near Tenterfield. Ore mined for the last year was a little over 100,000 tons, which was below expectations and unprofitable. Meanwhile, *Mineral Ventures N.L.* has announced that if drilling at Kangiara near Yass proves sufficient ore of grade similar to that previously mined, profits can be made at present metal prices.

TASMANIA—Diamond drilling of the *Savage River* iron ore deposits has been started by *Rio Australian Explorations Bty.* Equipment was flown to site by helicopters, because of the rough terrain. The firm recently withdrew from the *Renison* tin deposits.



TURKEY—A group of small copper processors have formed the *Copper Industry Company* with a capitalization of T £5,000,000. The group plan to set up a Turkish electrolytic copper plant which, it is expected, will save Turkey large amounts of foreign currency presently paid out for the processing of Turkish blister copper abroad.

KOREA—The Mining Bureau of the Ministry of Commerce & Industry is interested in developing the *Sunkyong* tin mine which reportedly is capable of producing 65 tons of 1.6 percent Sn ore daily. The Ministry plans to construct a refinery at the mine.

MALAYA—A French mining company, *Societe Anonyme des Etain de Kinta*, is said to be planning eventually to mine a three-acre cemetery near Kampar. The company will spend $10,000 in exhuming the graves and reburying the remains in a new cemetery. The company originally applied for this right in 1954, but did not receive permission until now. Because of the international control on tin, it is not desirable for the firm to mine now, but

New Caledonia's Nickel Occurs in Irregular Veins

This is the D'Artagna mine in Poya, New Caledonia, owned by Edouard Pentecost. A typical lateritic nickel deposit, the picture illustrates the irregular occurrence of the ore which is followed carefully by open pit mining leaving low-grade masses in place. In this particular operation, a Caterpillar 977 Traxcavator is used to mine and load the ore. New Caledonia is one of the major nickel producers of the world, along with Canada and Cuba. Much of the ore is smelted on New Caledonia, but a substantial tonnage is shipped to Japan for smelting; in fact, most of the Japanese nickel production is derived from ore mined in New Caledonia.

it will go ahead with plans for moving the graves since it had promised in the original offer.

PAKISTAN—Four Japanese mineral experts have been sent to Pakistan to help the government conduct mineral exploration surveys of the country. Two will work with the Geological Survey Department, while the other two will be at the disposal of the mineral concessions department. The latter will carry out mineral surveys in the mountainous regions on the frontiers of West Pakistan.

INDIA—The Indian government has abolished the export duty on manganese ore which assays less than 42 percent manganese dry basis. The duty on manganese ore with a manganese content of 42 to 44 percent has been reduced to 10 rupees per ton. Previous duty was 10 rupees per ton on ore with content up to 40 percent and 20 rupees on 40 to 44 percent ore.

JAPAN—Japanese copper smelters have made another reduction in production of electrolytic copper because of the current slump in the market. A 25 percent reduction has brought the output down to 8,000 tons monthly. A 15 percent reduction was made last October.

ISRAEL—Trial runs are being made in the new sulphuric acid plant at the Timna copper mines near Elat. The plant will supply the 10,000 tons of acid needed by the mines annually, but the sulphur or pyrite will have to be imported. About 5,500 tons of scrap iron will be imported out of the 8,500 tons needed. When production is at capacity, the Timna works is expected to produce about 7,000 tons of 78 percent cement copper annually.

INDIA—The *National Council for Applied Economic Research* has recommended to the *Union Commerce and Industry Ministry* the setting up of a mica wet grinding plant with an initial capacity of 1,000 tons a year, expandable to 2,000 tons. According to the council, such an installation would cost about Rupees 3 lakhs, and would not require any foreign investment. Indian mica producers and the Rajasthan government are said to be interested in participating in such a project.

BURMA—The *Burma Corporation (1951) Ltd.*, a joint venture of the *Burma Mines Ltd.* and the Burma government, continues geological exploration by diamond drilling in the concession area within the main *Bawdin* mine lease. A regional aerial survey is also being made of the 555-square-mile district held by the company. For the year ended June 30, 1957, the firm showed a net profit of $720,256—about half of the previous year's figure. This was due to the steep drop in metal prices and increased cost of operation—repairs, maintenance, supplies, stores, and a larger underground labor force.

MALAYA—Export quotas established by the International Tin Agreement for the companies under the management of *Anglo-Oriental (Malaya) Ltd.* are reported as follows (in tons of tin concentrates): *Ampat Tin Dredging* 199; *Berjuntai Tin Dredging* 287; *Kampong Lanjut Tin Dredging* 184; *Kamunting Tin Dredging* (excluding Thailand) 203; *Kramat Tin Dredging* 63; *Kuala Kampar Tin Fields* 284; *Larut Tin Fields* 70; *Lower Perak Tin Dredging* 291; *Rantau Tin Dredging Company* 124; *Southern Kinta Consolidated* 844; and *Taiping Consolidated* (operating on property of *Kundang Tin Dredging*) 103. These quotas were for the first period, and were based on provisional annual assessments only. Final assessments have not been announced.

INDIA—Manganese ore reserves are estimated at about 250,000 tons in Udaipur and Banswara areas of Rajasthan state by the Geological Survey of India. The deposits have been found at depths of 30 feet to 50 feet, and contain 40 to 50 percent Mn. Further prospecting is in progress.

KOREA—A mechanical breakdown has suspended dredging operations at the *Taechon-ni* alluvial gold mine for four months. The dredge was purchased with UNKRA funds for $521,500.

MALAYA—At the present rate of progress, it is expected that *Ayer Hitam Tin Dredging Company* will have its No. 2 dredge in operation early in 1959. In the vicinity of Penang, *Tongkah Harbour Tin Dredging Ltd.* has found a suitable dock site, and plans to reconstruct the company's dredge at that location. It is hoped that the whole reconstruction program will be completed early in 1960.

BURMA—The *Lough Chein* zinc mines in the Southern Shan States, which have been developed during the past five years by the *Mineral Resources Development Corporation*, have now been closed down. A small staff is being retained. The corporation had built a 30-mile gravel road from Mong Pawn, 38 miles east of Taunggyi. A staff of 500 had been employed. The *Pangnet* iron mines, 14 miles east of Mong Pawn, have also closed. These mines have a potential of 2,000 tons of iron ore daily when in full production.

INDIA—The Mysore Government has decided to develop the nationalized *Kolar Gold Fields* at an estimated cost of Rupees 30,300,000,000. Among the special features of the government's plan are the setting up of a new crushing plant at an estimated cost of Rupees 3,200,000,000; further provision of Rupees 3,300,000,000 for the exploration of the northern area of the *Nandy Droog* mine; sinking of a new shaft in the *Champion Reef* mine in place of the Biddick shaft which was wrecked by fire in 1956 (estimated cost Rupees 3,700,000,000); provision of Rupees 5,500,000,000 for *Champion Reef* mine below the 105 level; exploration at a cost of Rupees 2,600,000,000 with further provision of Rupees 7,000,000 for *Mysore* mine; and a provision of Rupees 5,600,000,000 for electrical and housing projects in the area. It is said that the state government plans to approach the Central government for inclusion of the above plan in the Second Five Year Plan itself.

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PASSAIC NEW JERSEY

QUEBEC—*Kennecott Copper Corporation* has signed an agreement with *Harricana Prospecting Syndicate* for a working option on 23,800 acres in the Chaste Township section near the Harricana River in northwestern Quebec. Kennecott

has also acquired additional property in the area through staking and purchasing so that its total holdings in the district are about 50,000 acres. Under the option, Kennecott will repay Harricana for the syndicate's preliminary expenses; Harricana will retain a 10 percent nonassessable interest in its claims for the first $1,000,000 spent by Kennecott on the property. On expenditures over $1,000,000, Harricana's interest will be assessable, pro rata, in order to maintain its equity. Kennecott also has the right to buy out Harricana's interest at any time during the next four years. *American Metal Climax, Inc.* has staked about 20,000 acres in the same area.

ONTARIO—*Steep Rock Iron Mines Ltd.* has decided to modify its expansion plans in view of the slowdown in demand for iron and steel. Production from the new Hogarth A-2 shaft will be deferred until 1961 so driving of the 1,800-foot crosscuts to reach the orebody will probably be stretched out. Construction of the two new concentrators is continuing on schedule, however, to meet customer demand for increased selectivity. These plants are expected to be in operation by the middle of June.

BRITISH COLUMBIA—Barite may prove to be a new source of revenue for *Giant Mascot Mines* at its worked-out lead-copper-zinc-silver property near Spillimacheen. There are an estimated 250,000 tons of barite in the firm's mill tailings pond and an undetermined amount in the mine assaying 30 to 50 percent barite and 1 percent lead. Marketing negotiations are underway. R. B. Buckerfield is president.

ALASKA—*United States Smelting Refining and Mining Company* will operate seven dredges this season in the Fairbanks area, but will curtail stripping and thawing activities. No new dredging ground will be opened this season, either, because of the high operating costs and the fixed price of gold.

NEW BRUNSWICK—The continued low prices for base metals have forced *Heath Steele Mines Ltd.* to defer its plans for bringing its lead-zinc-copper mine into full operation. Mine activities have been drastically curtailed. The mine and plant with a rated capacity of 45,000 tons of ore per month will continue breaking-in operations at less than one-third of capacity. A small staff and crew will be maintained at the mine to continue development and metallurgical work with a view to having the mine ready for full operation when base metal prices return to normal.

SASKATCHEWAN—*Radiore Uranium Mines* expects to be producing at a daily rate of 225 to 250 tons by early summer. Mine grade of ore has been steadily improving and is expected to level off at 0.18 percent U_3O_8. Mining is being carried out by cut and fill stoping methods on the fourth level where there are five stopes, and on the sixth level where there are three stopes. Deslimed mill tailing is used as fill and is pumped into each working place to support walls and provide a working floor.

QUEBEC—*Lake Asbestos of Quebec Ltd.* has appointed the Asbestos Division of *Metal Traders Ltd.* in London as its British asbestos sales agent. Charles Z. Carroll-Porczynski has been named division manager. The group will handle all sales in the United Kingdom, Ireland, Spain, and Portugal.

ALASKA—In the past season, *New York-Alaska Gold Dredging Corporation* experienced its most successful year in dredging. The firm operates in southwestern Alaska.

ONTARIO—A new uranium sales contract has been negotiated with the United Kingdom which calls for delivery to Britain of $105,000,000 worth of Canadian uranium between April 1, 1962 and March 31, 1963. This is in addition to an existing $115,000,000 contract. Canadian uranium production is expected to increase from 6,687 tons last year to 13,000 tons this year, and possibly 15,500 in 1959. Sole purchaser is the Crown-owned *Eldorado Mining and Refining Company.* The Trade Ministry has also announced plans for establishing a nuclear plant division of the Crown-owned *Atomic Energy Commission* at Toronto to direct a four-year $140,000,000 program in nuclear power development. The program includes direction of work on the 20,000-kilowatt nuclear power demonstrator being built on the Ottawa River near Chalk River, and construction of a 200,000-kilowatt atomic power plant at the end of four years.

MANITOBA—*Montgary Explorations Ltd.* has reduced the price of lithium concentrates in the hope of obtaining advanced contracts. Negotiations reportedly are underway with some United States interests. The firm has an estimated 8,000,000 tons grading 1.85 percent lithium at its mine at Bernic Lake. The deposit is said to contain a pocket of

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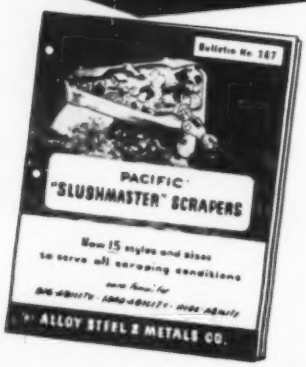

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2A	34"	550#
AB	36"	775#
AB	42"	850#
AB	48"	960#
AB	54"	1080#
3B	36"	1400#

Model	Size	Weight
3B	42"	1540#
3B	48"	1730#
3C	60"	2580#
3D	48"	2030#
3D	60"	2865#
3D	72"	3700#
3D	84"	4500#

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100,000 tons of pollucite ($CsSi_2AlO_6$) with an overall cesium content of 28.8 percent. A three-compartment shaft has been sunk 307 feet, with a station cut at 282 feet.

BRITISH COLUMBIA—The *Canadian Institute of Mining and Metallurgy* will meet in Vancouver April 21, 22, and 23. More than 800 delegates are expected to attend. Professor Henry M. Howard of the University of British Columbia, chairman of the British Columbia section of the CMM, is in charge of convention arrangements.

QUEBEC—*American Smelting & Refining Company*, through its subsidiary, *Asarco Nickel Company Ltd.*, has decided not to conduct any exploration work on its concession in Ungava this season. No decision has yet been made about ultimate disposition of the property in which Asarco holds a 63 percent interest if it develops the property or 30 percent if not. Exploration work to date had failed to indicate sufficient tonnage and grade to justify an integrated nickel operation there. Asarco spent about $1,000,000 in diamond drilling in 1957. It is understood that about 8,000,000 tons of ore were indicated. The original financing syndicate for this property includes Asarco, *Little Long Lac Gold Mines, Malartic Gold Fields, Teck-Hughes Gold Mines, Sylvanite Gold Mines, Delnite Mines, Ore & Chemical Corporation*, and *Le Moyne Exploration*.

ALASKA—*Alaska Rail Road* officials have conferred with F. S. Pettyjohn, president of the *MacLaren River Copper Corporation*, over a proposed 90-mile rail spur from Cantwell to the copper mine. Such a spur also would aid in opening up the entire basin area around the Copper and MacLaren rivers, potentially rich in minerals, by connecting mines with the port of Seward, from which shipments can then be made to smelters at Tacoma, Washington.

ONTARIO—*Stanrock Uranium Mines* has started up its new mill, and it is expected that production will reach 3,000 tons daily by fall. Underground work is continuing in both shafts on the property which is at Quirke Lake in the Blind River area. Two mining crews are operating from each shaft.

MANITOBA—*Rio Canadian Exploration*, subsidiary of *Rio Tinto Mining Company of Canada*, has received an option from *Skeena Silver Mines* covering 20 claims in the Moak-Mystery Lake area. Rio Canadian is to perform exploratory work for nickel for 2½ years. Skeena retains a one-third interest, plus up to $460 per claim. An airborne survey has already been made by Rio and ground work is now going on.

QUEBEC—Asbestos production is expected to hit a record high in 1958 with two new producers scheduled to go into operation this year. *National Asbestos Mines Ltd.*, a subsidiary of *National Gypsum Company*, anticipates an output of 3,000-tons-per-day from its open-pit mine and mill near the *Thetford Mines* in Thetford Township. *Lake Asbestos of Quebec Ltd.*, a subsidiary of *American Smelting and Refining Company*, plans an output of 5,000-ton-per-day from its *Black Lake* property, also in Thetford Township, which it is dewatering. In addition, *Carey-Canadian Mines* is replacing the existing *Quebec Asbestos Corporation* mine and mill at East Broughton with a new mine and mill with a capacity of 2,000 to 2,500 tons per day. This is also planned for operation this year. *Asbestos Corporation* is undertaking a $5,000,000 expansion at its *King* and *Beaver* mines with completion scheduled for the middle of this year, and *Canadian Johns-Manville* has just completed a $1,000,000 extension to its new mill and a second shaft to underground workings

ALASKA—The U.S. Air Force request for a withdrawal of 2,472,800 acres in the Tyonek area north of Cook Inlet has been cancelled. The reason given is that the land is no longer needed because of a change in Air Force planning. The land is open for mineral prospecting and claim location.

BRITISH COLUMBIA—*Canadian Exploration*, a wholly owned subsidiary of *Placer Development*, is managing the copper-iron prospect of *Craigmont Mines* in Highland Valley, B.C. Canadian Exploration is reported to be providing $100,000 in initial financing of the program and has options on 300,000 shares of Craigmont stock. Diamond drilling has disclosed copper and magnetite iron ore values below the 280-foot level.

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U.S.A. Metal & Mineral Prices

March 17, 1958

METALS

COPPER: **Electrolytic.** Delivered F.o.b. cars, Valley basis ..... 25.00¢
Lake. Delivered, destinations, U.S.A. ..... 25.00¢
Foreign Copper. Valley basis ..... 25.00¢
Custom ..... 24.50¢
LEAD: **Common Grade.** New York ..... 13.00¢
Tri-State Concentrate, 80% lead $156.12
ZINC: **Prime Western:** F.o.b. E. St. Louis ..... 10.00¢
Prime Western: Delivered, New York ..... 10.50¢
Tri-State Concentrate, 60% zinc, per ton $56.00
ALUMINUM: **Primary 30 Pound Ingots (99% plus).** ..... 28.10¢
ANTIMONY: **Lone Star Brand. F.o.b. Laredo, in bulk** ..... 29.50¢
BISMUTH: (In ton lots) price per pound $1.55
CADMIUM: **Sticks and bars.** 1 to 5 ton lots (Price per pound) $1.70
COBALT: **97.99%,** keg of 550 pounds (Price per pound) ... $2.00
COLUMBIUM: **Powder** ..... Nom., per pound $120.00
GERMANIUM: **Germanium:** dioxide, high purity, gram .. 24.00¢-30.00¢
LITHIUM: **98%** (per pound) ..... $11.00-$14.00
MAGNESIUM: **Ingots (98.8%)** F.o.b. Valasco, Texas, per pound 36.00¢
MERCURY: **Flasks.** Small lots, New York ..... $230.00-$233.00
NICKEL: **"F" Ingots (5 pounds).** F.o.b. Port Colbourne, Ontario 75.50¢
PLUTONIUM: To July 1, 1962 AEC will pay $30.00 to $40.00 per gram depending on plutonium 240 content. July 1, 1962 to June 30, 1963, per gram $30.00
SELENIUM: **99.5%,** per pound $7.50
THORIUM: per kilogram $43.00
TIN: **Grade A Brands.** New York (per pound) Prompt delivery. 95.125¢
TITANIUM: **99.3%** + Grade "A" Sponge (Price per pound) $1.65-$2.50
URANIUM: **Nominal,** per kilogram $40.00
U-235: **Nominal,** per pound 7,725
GOLD: **United States Treasury Price** ..... $35.00 per ounce
SILVER: **Newly mined domestic.** U.S. Treasury price ..... 90.5¢
Foreign Handy Harmon ..... 88⅝¢
PLATINUM: Per Ounce ..... $72.00-$75.00
ZIRCONIUM: **Sponge, Per Pound,** Reactor Grade $7.50

ORES AND CONCENTRATES

BERYLLIUM ORE: **10 to 12% BeO.** F.o.b. mine, Colorado $46.00 per unit Small lot purchases at Custer, S. D., Spruce Pine, N. C., and Franklin, N. H. Visual inspection at $400.00 per short ton or by assaying at: 8.0 to 8.9% BeO, $40 per unit; 9.0 to 9.9%, $45; over 10.0%, $50.
CHROME ORE: F.o.b. railroad cars eastern seaports. Dry long tons
African (Rhodesian). 48% CR_2O_3. 3 to 1 Ratio ..... $46.00-$47.00
African (Transvaal). 48% Cr_2O_3. No ratio ..... $36.00-$37.00
Turkish, 48% Cr_2O_3. 3 to 1 chrome-iron ratio .... Nominal $53.00
U.S. Government ore purchase depot Grants Pass, Oregon, Base price, lumpy ore, $115.00; fines and concentrates $110.00 for 48% Cr_2O_3 and a 3 to 1 chromium-iron ratio. Premiums for higher grade are and for a ratio up to 3.5 to 1. Penalties for grades down to 42% Cr_2O_3.
COLUMBIUM-TANTALUM ORE: At United States small lot beryl purchase depots. $3.40 per pound contained combined pentoxides in 50% ore. Includes 100% bonus. (Government stopped buying temporarily May 12, 1957) ..... Per Pound Pentoxide ..... $1.15-$1.35
IRON ORE: **Lake Superior. Per gross ton Lower Lake Ports**
Mesabi, Non Bessemer, 51.5% Fe $11.45
Mesabi, Bessemer, 51.5% Fe $11.60
Old Range Non Bessemer $11.70
Old Range Bessemer $11.85
Swedish, Atlantic Ports, 60 to 68% Fe Contracts, Per Unit.. 26.00¢
MANGANESE ORE: **Metallurgical grade.** 48 to 50% Mn. Long ton unit ..... $1.35-$1.40
Metallurgical grade. 46 to 48% Mn. Long ton unit .... $1.30-$1.35
Metallurgical grade. 44 to 46% Mn. Long ton unit .... $1.25-$1.30
Domestic U.S. Government purchasing depots: Butte, Mont.; (black and pink ores) base price of $4.87 per long dry ton of 18% manganese ore. Phillipsburg, Mont.; base $6.43 per long ton of 15% manganese ore. Small lot program f.o.b. railroad cars, minimum 40%. Base (48%) $2.30 per unit with premiums and penalties.
MOLYBDENUM CONCENTRATE: **90% MoS_2 F.o.b.** Climax, Colorado. Per pound Mo, plus container cost $1.18
TUNGSTEN CONCENTRATE: **Domestic.** 60% WO_3 Per short ton unit $14.00
Foreign. 65% WO_3 Per short ton unit (Scheelite) .. Nominal $15.00
Foreign. South American, Spanish, Portuguese .... Nominal $13.50
URANIUM ORE: F.o.b. purchase depot or company mill in accordance with AEC schedules and company buying contracts. Basic price is $1.50 per pound of U_3O_8 in ore assaying 0.10 percent. For each additional 0.01 add 20¢. Subject to development allowance, premiums, penalties where applicable.

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BORON: Technical grade .... F.o.b. Boron, California. Per ton $47.50
FLUORSPAR: **Metallurgical grade.** 72.5 % effective CaF_2 content per short ton F.o.b. Illinois-Kentucky mines .... $36.00-$38.00
Mexican. 70% F.o.b. border ..... $26.00-$27.00
Acid Grade. 97% CaF_2, Bulk, F.o.b. mine ..... $48.00-$52.00
Government buying F.o.b. producer's shipping point: 60% Illinois-Kentucky, $34.50 per ton, others $28.50; 70% Ill.-Ken. $38.50, others $32.50.
PERLITE: **Crude:** F.o.b. mine per short ton ..... $3.00 to $5.00
Plaster grades. Crushed and sized. F.o.b. plants .... $7.00 to $9.00
SULPHUR: Long ton, F.o.b. Hoskins Mound, Texas $25.00
Export ..... $24.00-$25.00

LONDON METAL AND MINERAL PRICES

March 17, 1958

		Per Long Ton		USA Equivalent cents per pound[1]
COPPER:	**Electrolytic spot**	£167	0s 0d	20.87¢
LEAD:	**Refined 99%**	£ 74	15s 0d	9.34¢
ZINC:	**Virgin, 98%**	£ 63	5s 0d	7.91¢
ALUMINUM:	**Ingot, 95.5%**	£197	0s 0d	24.625¢
ANTIMONY:	**Regulus, 99.6%**	£197	10s 0d	24.69¢
TIN:	**Standard, 99.75%** ..	£733	0s 0d	91.63¢
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Argentina's New District

Continued from page 51

some 70 tons of ore per day and operations are expected to begin in early 1958.

160,000,000 Tons Iron Ore

At Sierra Grande, less than 20 miles from the San Matias Gulf, the importance of a promising hematite-magnetite prospect was recognized in 1951. Under the direction of the Argentine government's Direccion Nacional de Mineria, 90 trenches were dug and 68 diamond drill holes put down in 1950 and 1951 which soon developed some 160,000,000 tons of 55 percent iron ore. This hematite-magnetite ore seems to occur in a faulted(?) syncline and ore has been calculated in the two zones where the synclinal limbs cut the surface. The ore possibilities in the deeply buried apex have yet to be investigated. This deposit is considered one of the most important in Argentina and is certain to figure prominently in the future economic plans of the country.

Conclusions

The area of about 10,000 square miles bordering the San Matias Gulf in eastern Argentina has proved in recent years to be one of the most fertile districts for new discoveries of minerals in all Argentina. From a region whose economy was based on subsistence farming and a little herding in 1950, this zone now ships to Buenos Aires mineral products worth over $250,000 each year. This figure should increase substantially in the next few years when the tungsten mines and Sierra Grande iron mines come into production.

This progress is all the more remarkable considering that the region is quite flat with very few rock outcrops and no geophysical prospecting methods had been used.

Prospecting and exploration is now being carried out on a large scale by several Argentine companies plus many individuals, and it is to be expected that this region will be the scene of important new mineral discoveries in the future.

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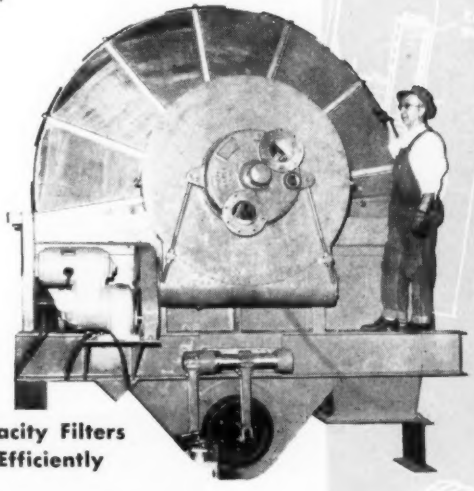

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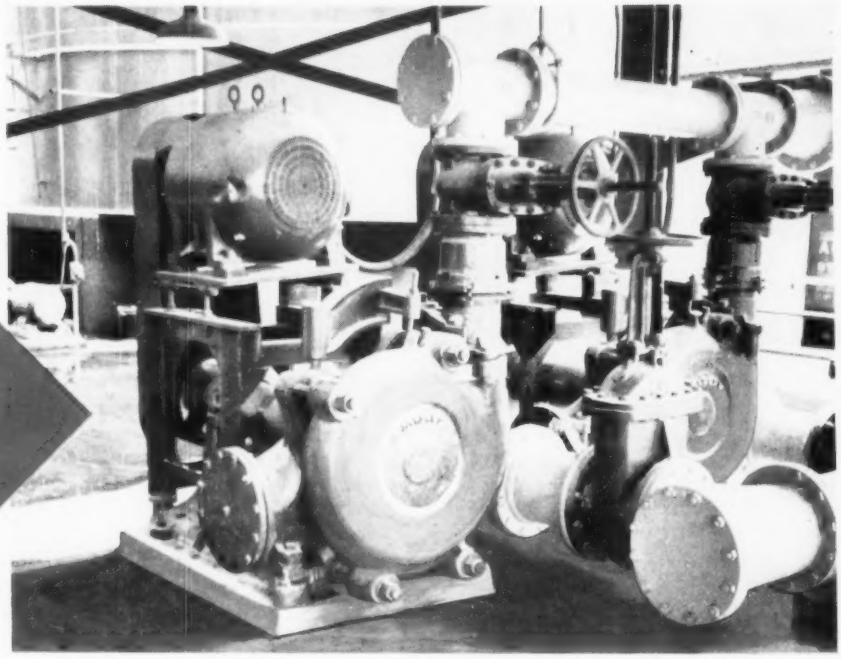

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